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TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1864.

No. 164.

THE RISDON IRON AND LOCOMOTIVE WORKS,
APPELLANT,

vs.

PHILIP MEDART AND WILLIAM MEDART.

APPEAL FROM THE CIRCUIT COURT OF THE [illegible]
THE NORTHERN DISTRICT OF [illegible].

FILED [illegible], 1865.

(14,641.)

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1894.

No. 164.

THE RISDON IRON AND LOCOMOTIVE WORKS,
APPELLANT,

vs.

PHILIP MEDART AND WILLIAM MEDART.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE NORTHERN DISTRICT OF CALIFORNIA.

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JUDD & DETWEILER, PRINTERS, WASHINGTON, D. C., SEPTEMBER 10, 1894.

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1 UNITED STATES OF AMERICA, } ss:
District of California, }

In the Circuit Court of the United States in and for the District of California.

PHILIP MEDART and WM. MEDART, Complainants,
vs.
RISDON IRON AND LOCOMOTIVE WORKS, WM. H. TAYLOR, and JOSEPH MOORE, Defendants. } Equity.

Bill of Complaint.

To the honorable judges of the circuit court of the United States in and for the district of California:

Philip Medart and Wm. Medart, of the city of St. Louis and State of Missouri, and citizens of said State, and citizens of the United States, bring this their bill of complaint against the "Risdon Iron and Locomotive Works," William Taylor, and Joseph Moore, all citizens of the State of California and residents of said State, doing business in said State; and thereupon your orators complain and say that heretofore and before the 25th day of October, 1881, Philip Medart was the true, original, and first inventor of a certain new and useful improvement in the manufacture of belt pulleys now known or used before his invention or discovery thereof and not in public use or on sale for more than two years prior to
2 his application for a patent therefor.

And your orators further show unto your honors that the said Philip Medart, being then a citizen of the United States and so being the inventor of said improvements, made his application in writing to the proper department of the Government of the United States for letters patent in accordance with the then existing laws of Congress of the United States, and duly complied with all acts of Congress in relation thereto, and before the said 25th day of October, 1881, he duly assigned a one-half undivided interest in and to said invention to William Medart for a good and valuable consideration; whereupon, on the said 25th day of October, 1881, letters patent of the United States, numbered 248,599, signed, sealed, and executed in due form of law, for said invention or discovery was issued to the said Philip Medart, of St. Louis, Mo., assignor of one-half to Wm. Medart, of the same place, and to the said William Medart, jointly, whereby there was secured to him and the said William Medart for the term of seventeen years from the said 25th day of October, 1881, the full and exclusive right of making, using, and vending the said invention or discovery and granting to others the right to make, use, and vend the same throughout the United States and territories thereof; which patent is herewith filed and marked Exhibit "A" and made a part of this bill, or will be produced in court when your honors may direct.

And your orators, further complaining, state and show unto your honors that said Philip Medart, being then a citizen of the United States, was before the 25th day of October, 1881, the true and original and first inventor of a certain improved belt pulley not known or used before his invention or discovery thereof and not in
3 public use or on sale for more than two years prior to his application for a patent therefor.

And your orators further show unto your honors that the said Philip Medart, being then a citizen of the United States and so being the inventor of said improved belt pulley, made his application in writing to the proper department of the Government of the United States for letters patent in accordance with the then existing laws of the Congress of the United States and duly complied with the acts of Congress in relation to said application, and before the said 25th day of October, 1881, duly assigned, for valuable consideration, one-half undivided interest in and to said invention or discovery to William Medart; whereupon, on the 25th day of October, 1881, letters patent of the United States, numbered 248,598, signed, sealed, and executed in due form of law, for said invention or discovery were issued to him, the said Philip Medart, of St. Louis, Mo., assignor of one-half to William Medart, of the same place, and to the said William Medart jointly, which letters patent is herewith filed and made a part of this bill and marked Exhibit "B," whereby there was secured to him and the said William Medart for the term of seventeen years from the date thereof the full and exclusive right of making, using, and vending said invention and granting to others the right to make, use, and vend said invention or discovery in the United States and all the territories thereof.

And the complainants show unto your honors that heretofore and before the 8th day of March, 1881, Philip Medart was the true first and original inventor of certain new and useful improvements in belt pulleys not known or used before his invention or discovery thereof and not in public use or on sale for more than two years prior to his application for a patent therefor; and your orators fur-
ther show unto your honors that said Philip Medart, being
4 then a citizen of the United States and so being the inventor of said improvement, made his application in writing to the proper department of the Government of the United States and duly complied with all the requirements of the acts of Congress in relation thereto, and before the 8th day of March, 1881, duly assigned one-half undivided interest in and to said invention to Wm. Medart; whereupon, on the 8th day of March, 1881, letters patent of the United States, numbered 238,702, signed, sealed, and executed in due form of law, for said invention or discovery was issued to the said Philip Medart, of St. Louis, Mo., assignor of one-half to Wm. Medart, of the same place, and to said William Medart, jointly, whereby there was secured to him and the said William Medart for the term of seventeen years from the said 8th day of March, 1881, the full — exclusive right of making, using, and vending the said invention or discovery and granting to others the right to make, use, and vend the same throughput the United States and territories

thereof; which patent is herewith filed and marked Exhibit "C" and made a part of this bill, or will be produced in court when your honors may direct.

And your orators further show unto your honors that your orators have extensively applied the said inventions or discoveries to practical use and have been and are now carrying on a large and extensive business in the manufacture and sale of said pulleys, and but for the infringements hereinafter complained of would still be in the undisturbed possession, use, and enjoyment of the exclusive privileges secured to them by said letters patents and in receipt of the profits of the same.

And they further show unto your honors that they have licensed many persons to manufacture said pulleys under and by vir-
5 tue of said patent, who pay them royalty, and spent large sums of money in advertising said pulleys and introducing the same to the trade, and the defendants were long prior to bringing this complaint duly notified of the infringement of said patents by them and for a long — prior to bringing this suit had knowledge of the existence of said patents and the rights of the complainants secured thereby (and the complainants further show unto your honors that they have long since caused to be placed upon their pulleys made and sold by them the words patented and the date of each patent).

And your orators further show unto your honors, as they are informed and believe, that the said defendant, "Risdon Iron and Locomotive Works," is and has been a corporation being and existing by virtue of the laws of the State of California and doing business in said State, and that William H. Taylor is its president and Joseph Moore is its superintendent and have been so for a long time, and as such president and superintendent are managing, directing, and conducting the affairs of said corporation in the manufacture of pulleys embodying the improvements and inventions set forth in said two patents for the mutual and several benefit of each of the defendants herein.

That said defendants herein, well knowing all the facts herein set forth, are now making, using, and vending the said patented inventions or improvements described and claimed in said three patents, or substantially the same in construction and operation as in said three letters patents mentioned and claimed, and are manufacturing pulleys embodying substantially the same mechanical construction and operation and manufacture as are embodyied in patent number 248,598 and number 238,702, containing the same features thereof, and that they are now and have been for a
6 long time making, using, and vending to others to use pulleys which are made after and embody the same process of manufacture as is described and claimed in patent number 248,599, and that the pulleys which they are making, using, and vending are constructed substantially after the same process and embody substantially the same elements of construction as are secured to the complainants by said patents number 248,599 and 248,598 and 238,702, and thus infringe the rights of your orators secured by

patent dated 25th day of October, 1881, and numbered 248,599, and by patent dated 8th day of March, 1881, No. 238,702, and thus infringe the rights of your orators secured by patent dated 25th day of October, 1881, and numbered 248,598, and this they have done without the authority of the complainants and in violation of their rights in the State of California and other places, and are still making and vending said pulleys and intend so to do within the State of California and within the district of California, and, as these complainants believe, are inducing others so to do, all in violation of the said letters patent aforesaid.

To the end, therefore, that the defendants may, if they can, show reason why your orators should not have the relief hereby prayed, and that they make a full disclosure and discovery of all the matters aforesaid and upon their several corporate oaths, according to the best and utmost of their knowledge, remembrance, information, and belief, and the utmost and best knowledge, remembrance, information, and belief of the president and manager of said corporation, one of the defendants, for said corporation, full, true, direct, and perfect answer make to the several allegations of this bill as though special interrogatories relative thereto had been filed, and

7 shall full, true, and perfect answer make to the several interrogatories hereunto filed and numbered and set forth, 1, 2, 3, 4, 5, 6, 7, 8, and 9, as by note hereinafter written they are severally required to answer.

And now, to the end that the defendants may be compelled to account for and pay over the income thus unlawfully derived from the violation of the rights of your orators as above stated and be restrained from any further violation of said rights and infringement of said patent, your orators pray that your honors grant a perpetual writ of injunction, restraining said defendants, their agents, employees, and attorneys, collectively and individually, from any further violation of the said rights of the complainants, and them and their agents, employees, and attorneys from any further sale, manufacture, or use in any manner of said patented invention or inventions or improvement or improvements aforesaid, or any part thereof, in violation of the rights of your orators as aforesaid, and from further infringing said patent or patents aforesaid, and that said patent pulleys containing said improvements and inventions now in possession of said defendants or either of them, or used or sold by them, may be destroyed or delivered up to your orators for that purpose.

And also that your honors, on rendering the decree for an infringement as above prayed for, may proceed to assess or cause to be assessed under your direction, in addition to the profits to be accounted for by the defendants as aforesaid, the damages your orators have sustained by reason of such infringement, and that your honors may increase the actual damages assessed to a sum equal to three times the amount of such assessment, under the circumstances of the willful and unjust infringement, as herein set forth.

8 And your orators pray also for such other and further relief as the equity of the case may require and to your honors may seem just and proper.

May it please your honors to grant unto your orators not only an injunction conformable to the prayer of this bill, but also a writ of subpœna of the United States of America, directed to the Risdon Iron and Locomotive Works, a corporation; William H. Taylor, and Joseph Moore, commanding them and each of them to appear and answer unto this bill of complaint, and also to answer the several interrogatories hereto annexed and numbered, as in the bill stated, and to abide and perform such other order and decree in the premises as to the court shall seem meet and be required by the principles of equity and good conscience; and they will ever pray.

WM. M. ECCLES,
Counsel and Solicitor for Complainants.

UNITED STATES OF AMERICA, }
Eastern District of Missouri, } *ss:*

Philip Medart and William Medart, the complainants in the foregoing bill of complaint named, being duly sworn, depose and say that the facts, so far as the statements therein contained are within their own knowledge, are true, and so far as they are derived from information of others they verily believe them to be true; and they further say they verily believe Philip Medart to be the true, original, and first inventor of the new and useful improvements in belt pulleys which are described and claimed in said two letters patents granted to them and mentioned in the fore-
9 going bill; and your deponents verily believe that the title of the complainants as set forth in said bill is true.

WM. MEDART.
PHILIP MEDART.

Subscribed and sworn to before me this 23rd day of July, 1885.
A. P. SELBY,
[SEAL.] *Clerk U. S. Circuit Court, Eastern District of Missouri,*
By T. L. CRAWFORD, *Deputy.*

10 *Interrogatories.*

To all of the defendants herein:

1. Is the defendant The "Risdon Iron and Locomotive Works" a corporation doing business in the State of California?

2. Who is its president and who is its superintendent?

3. Whether you or either of you are manufacturing and selling belt pulleys having the ends of the spider arms ground off concentrically with the axis of the pulley?

4. Are you or either of you manufacturing and selling pulleys in which the rim and the ends of the spider arms are ground off concentrically with the axis of the pulleys?

5. Do you not in manufacturing your pulleys first grind off the ends of the arms of spiders of the pulleys concentrically with the

center by suitable machinery for that purpose, and then attach the wrought-iron rim to these ends, and then grind off the rim concentrically?

6. Does not William H. Taylor, as president, and Joseph Moore, as superintendent, direct and control the kind of pulleys manufactured by the "Risdon Iron and Locomotive Works?"

7. Have you or either of you stock in said corporation and do you or either of you have any pecuniary interest in the proceeds of said corporation?

8. Were you not notified by the orators herein that you were infringing said patent set out in this bill long prior to bringing this suit?

9. Do you not manufacture and sell pulleys with wrought-metal rims which have a crown formed on the rim at the same time that it is bent in a circle and by the same rolls or rollers?

WM. M. ECCLES,
Solicitor for Complainants.

11 *Note.*

To the defendants herein:

You and each of you, for yourselves and for the Risdon Iron and Locomotive Works, will please answer each of the interrogatories consecutively, commencing with No. one and ending with No. nine.

WM. M. ECCLES,
Solicitor for Complainants.

Endorsed: Filed August 3, 1885. L. S. B. Sawyer, clerk.

12 *Subpœna ad Respondendum.*

UNITED STATES OF AMERICA:

Circuit Court of the United States, Ninth Circuit, District of California. In Equity.

The President of the United States of America to Risdon Iron and Locomotive Works, Wm. H. Taylor, and Joseph Moore, Greeting:

You are hereby commanded that you be and appear in said circuit court of the United States aforesaid, at the court-room in San Francisco, on the seventh day of September, A. D. 1885, to answer a bill of complaint exhibited against you in said court by Philip Medart and Wm. Medart, who are citizens of the State of Missouri, and to do and receive what the said court shall have considered in that behalf; and this you are not to omit under the penalty of five thousand dollars.

Witness the Honorable Morrison R. Waite, Chief Justice of the Supreme Court of the United States, this 3rd day of August, in the year of our Lord one thousand eight hundred and eighty-five, and of our Independence the 110th.

[SEAL.]

L. S. B. SAWYER, *Clerk.*

Memorandum Pursuant to Rule 12, *Supreme Court U. S.*

You are hereby required to enter your appearance in the above suit on or before the first Monday of September next, at the clerk's office of said court, pursuant to said bill; otherwise the said bill will be taken *pro confesso*.

L. S. B. SAWYER, *Clerk*.

13 Endorsed.

Marshal's Return to Subpœna.

UNITED STATES MARSHAL'S OFFICE,
DISTRICT OF CALIFORNIA.

I hereby certify that I received the within writ on the 3rd day of August, 1885, and personally served the same on the 4th day of August, 1885, by delivering to and leaving with W. H. Taylor, one of said defendants named therein, personally, at the city and county of San Francisco, in said district, a certified copy thereof, and on the same day on the Risdon Iron and Locomotive Works by delivering to and leaving with W. H. Taylor, president of said Risdon Iron and Locomotive Works, said defendant therein, at the city and county of San Francisco, in said district, a certified copy thereof.

I further certify that I am informed and believe that Jos. Moore, one of said defendants named therein, is in Europe.

San Francisco, Aug. 4th, 1885.

M. M. DREW,
U. S. Marshal,
By W. G. GREGORY, *Deputy*.

Filed August 4, 1885.

L. S. B. SAWYER, *Clerk*,
By F. D. MONCKTON,
Deputy Clerk.

14 *Demurrer.*

United States Circuit Court, District of California.

PHILIP MEDART and WILLIAM MEDART, Complainants,
vs.
RISDON IRON AND LOCOMOTIVE WORKS, W. H. TAYLOR, and JOSEPH MOORE, Defendants.

The demurrer of the above-named defendants, The Risdon Iron and Locomotive Works, W. H. Taylor, and Joseph Moore, to the bill of complaint of Philip Medart and Wm. Medart, complainants.

These defendants respectively, by protestation, not confessing or acknowledging all or any of the matters and things in said bill of complaint to be true in such manner and form as the same are therein and thereby set forth and alleged, do demur thereto and to the several parts thereof, and for cause of demurrer show that the said complainants have not by their said bill made such a case as

entitles them in a court of equity to any relief from or against these defendants or either of them touching the matters contained in the said bill or any of such matters.

And the said defendants specifically demur to so much of the said bill of complaint as purports to set out a cause of action founded upon an alleged infringement of letters patent No. 248,599, dated Oct. 25, 1881, and for cause of demurrer shows that said letters patent are void upon their face, as they cover nothing, but were mechanical motions of men and mechinery, neither of which constitute patentable inventions.

15 And the said defendants further specifically demur to that portion of said bill of complaint which purports to set out a cause of action founded upon an alleged infringement of letters patent No. 248,598, dated Oct. 25, 1881, and for ground of demurrer show that said patent is void upon its face, as it covers nothing except an asserted excellence of mechanical workmanship, and does not cover or purport to cover any patentable discovery or invention.

The said defendants further specifically demur to that portion of said bill of complaint which purports to state a cause of action based on an alleged infringement of letters patent No. 238,702, dated March 8, 1881, and for cause of demurrer thereto show that the said patent is void upon its face.

That it does not cover or purport to cover anything except a belt pulley of ordinary form and constructed of the ordinary materials of wood and iron. Nothing is described as new in the patent except constructing the usual crown or dish on the rim of wrought metal-rimmed pulleys by bending said rim transversely during the process of manufacture, and of inserting wooden arms in the pulley by the use of ordinary brackets and sockets, neither of which articles constitute any patentable invention or discovery.

Wherefore, and for other good causes of demurrer in the said bill of complaint, these defendants do demur to the said bill and the several parts thereof above specified and to all the matters and things therein contained, and humbly pray the judgment of this honorable court whether they shall be compelled to make any further answer to the said bill, and they pray to be hence dismissed with their reasonable costs in this behalf sustained.

M. A. WHEATON,
Solicitor and of Counsel for Defendants.

16 I certify that in my opinion the foregoing demurrer of the Risdon Iron and Locomotive Works, W. H. Taylor, and Joseph Moore to the said bill of complaint of Philip Medart and Wm. Medart, complainants, is well founded in law and proper to be filed in the above cause.

M. A. WHEATON,
Of Counsel for Defendants.

UNITED STATES OF AMERICA, } ss:
District of California, }

W. H. Taylor, being duly sworn, deposes and says that he has read the foregoing demurrer to the bill of complaint in this suit,

and that the same is not interposed for the purpose of delaying said suit or any proceedings therein.

W. H. TAYLOR.

Subscribed and sworn to before me this 8th day of October, A. D. 1885.

JAMES MASON,
[SEAL.] *Notary Public.*

Endorsed: Filed October 9th, 1885. L. S. B. Sawyer, clerk, by F. D. Monckton, deputy clerk.

17 At a stated term, to wit, the February term, A. D. 1886, of the circuit court of the United States of America of the ninth judicial circuit in and for the district of California, held at the court-room, in the city and county of San Francisco, on Monday, the 15th day of March, in the year of our Lord one thousand eight hundred and eighty-six.

Present: The Honorable Lorenzo Sawyer, circuit judge.

Order Overruling Demurrer.

PHILIP MEDART *et al.*
vs.
RISDON IRON AND LOCOMOTIVE WORKS *et al.* } No. 3805.

This cause, heretofore argued and submitted to the court for consideration and decision upon the demurrer herein, having been duly considered, it is ordered that said demurrer be, and the same hereby is, overruled, with leave to the respondents to answer herein on the ~~on~~ *the* payment of twenty dollars.

18 *Answer.*

In the Circuit Court of the United States, Ninth Circuit, District of California.

PHILIP MEDART and WILLIAM MEDART, Complainants,
vs.
RISDON IRON AND LOCOMOTIVE WORKS, WILLIAM H. TAYLOR, and JOSEPH MOORE, Defendants.

The answer of Risdon Iron and Locomotive Works, William H. Taylor, and Joseph Moore, defendants, to the bill of complaint of Philip Medart and William Medart, complainants.

These defendants, now and at all times hereafter saving and reserving unto themselves all benefit and advantage of exception which can or may be had or taken to the many errors, uncertainties, and other imperfections in the said complainants' said bill of complaint contained, for answer thereto, or unto so much or such parts thereof as these defendants are advised is or are material or

necessary for them to make answer unto, these defendants, for answering, saith:

That it is not true that Philip Medart was the original and first inventor or any inventor of the improvement or improvements in the manufacture of belt pulleys described in the letters patent first mentioned in the complainants' said bill of complaint, bearing date on the 25th of October, 1881, numbered 248,599, and marked Exhibit A. Defendants deny that said Philip Medart invented any of the processes described or mentioned in the said letters patent.

19 Defendants admit that said letters patents were issued as alleged in said bill of complaint, but deny that the same describe or cover any patentable invention whatever. Defendants aver that said letters patent are null and void and invalid, for the reason that they do not describe or cover any patentable invention or improvement, nor any invention or improvement of which the said Philip Medart was the inventor. Said defendants deny that said letters patent secure to said Philip Medart or to the complainants in this case, for the term of seventeen years of for any other term, the full and exclusive right or any right of either making or using or vending said invention or of granting to others the right to either make or use or vend the invention or discovery in said letters patent, either within the United States or anywhere else.

And, further answer-, said defendants deny that the said Philip Medart was the original and first inventor or any inventor of the improved belt pulley or of any belt pulley, or of any improvement or of any invention described in or covered by the letters patent secondly mentioned in said bill of complaint, bearing date on the 25th day of October, 1881, and numbered 248,598 and marked Exhibit B in said bill of complaint. Said defendants deny that said last-mentioned letters patent describe or cover any patentable improvement or invention, and for this reason, among others, these defendants aver that said letters patent are invalid and void.

And, further answering, said defendants deny that the said Philip Medart was the original and first inventor or discoverer or any inventor or discoverer of the improvements in belt pulleys or inventions described in the letters patent thirdly mentioned in said bill of complaint, bearing date on the 8th day of March, 1881,

20 numbered 238,702, and marked Exhibit C in said bill of complaint. Defendants deny that said letters patent cover any patentable improvement or invention, and aver that the same are null and void and invalid, for this reason and also because said Philip Medart was not the original inventor or any inventor of the belt pulley or improvements in belt pulleys mentioned and described in said letters patent.

Said defendants deny that said letters patent secure to said Philip Medart or the complainants in this case, for the term of seventeen years of for any other term, the full and exclusive right or any right of either making or using or vending the said invention or any invention, or of granting to others the right to either make or use

or vend the inventions or discoveries described in said letters patent or either of them within the United States or anywhere else.

And, further answer-, these defendants say that each and every one of the inventions and improvements described and claimed in the two patents declared upon in the bill of complaint in this case, marked respectively Exhibit B and Exhibit C, are shown and described and patented in a certain English patent which was granted by the government of Great Britain to Robert Mathers, of Leeds, in the county of York, in England, which said English patent was granted on the 11th day December, 1873. Said English patent is number 2081 of the year 1873.

These defendants further aver that the inventions and improvements described in and claimed by said two patents, Exhibit B and Exhibit C, are also shown and described and patented in a certain other English patent, which was granted by the government of Great Britain to Richard Russel Gubbins on the 1st day of Nov., 1879, for an improved portable wheel. Said patent was
21 dated Nov. 1st, 1879, and was numbered 4465 of English patents for the year 1879.

And, further answering, these defendants aver that long prior to the invention thereof by the said Philip Medart metal pulleys were made ata certain foundry and machine shop named and known as the Vulcan iron works by Joseph Moore; also by George Gordon; also by E. T. Steen; also by William H. Birch. Said Vulcan iron works was a machine shop and foundry located at numbers 135 and 137 Fremont St., in this the city and county of San Francisco, State of California. The said Joseph Moore now resides in the city of London, England. Said Wm. H. Birch resides at the northeast corner of Sutter and Pierce streets, in this the said city and county of San Francisco. The said E. T. Steen resides at 404 Golden Gate avenue, in this the said city and county of San Francisco. The said George Gordon is dead.

Said defendants further aver that the said metal pulleys so made at the said Vulcan iron works by the said Isaac Moore and William H. Birch and E. T. Steen and George Gordan were made with a cast-iron spider and wrought-iron rimmed, contained all the inventions and improvements described in and covered by the said two letters patent marked respectively Exhibit B and Exhibit C in said bill of complaint.

And defendants further aver that in manufacturing the said pulleys at said Vulcan iron works the said Joseph Moore and said Wm. H. Birch and E. T. Steen and George Gordon used the same process which is described and claimed in the letters patent first mentioned in the complaint and marked "Exhibit A."

And, further answering, the said defendants and each of them deny that they or either of them are now either making,
22 using, or vending, or that they or either of them have been at any time either making, using, or vending the patented inventions or improvements or any of the patented inventions or improvements described and claimed in said three letters patents or in either of the said three letters patents. Said defendants and each

of them deny that they or either of them are now or ever have been manufacturing pulleys as described and claimed in either of the two patents, No. 248,598 and No. 238,702, mentioned in the bill of complaint.

Said defendants aver that they now are and for many years last past have been manufact*u*ring belt pulleys of verious kinds and descriptions, and aver that all ordinary belt pulleys embody substantially the same mechanical construction and operation. They aver that the mechanical construction and operation of the pulleys described and claimed in the said let-ers patent and each of them embody the same substantial construction and operation which belt pulleys have usually embodied for more than twenty years last past and none other. Said dfendants deny that any of the belt pulleys made by them are infringements of either of the letters patent mentioned in the complaint, marked Exhibit- B and C, and deny that the process which they have used in the manufacture of any of their belt pulleys is an infringement of the letters patent marked Exhibit A in said bill of complaint.

And, further answering, the said defendants deny that the said complainants are entitled to the relief or any part thereof in the said bill of complaint demanded, and the defendants pray the same advantage of their aforesaid answer as if they had pleaded to the said bill of complaint, and these defendants pray leave to be dismissed with their reasonable costs and charges in this behalf most wrongfully sustained.

M. A. WHEATON,
Solicitor for Defendants.

M. A. WHEATON,
Of Counsel for Defendants.

23 STATE OF CALIFORNIA, }
City and County of San Francisco, } *ss.*:

W. H. Taylor, being duly sworn, deposes and says that he is one of the defendants and is also president of The Risdon Iron and Locomotive Works, defendant in the foregoing answer, and that by means of his said office he has acquired and possesses particular knowledge of the matters stated in said answer; that he has read the foregoing answer and knows the contents thereof, and that the same is true of his own knowledge except as to the matters therein stated on information and belief, and as to those matters he verily believes it to be true.

W. H. TAYLOR.

Subscribed and sworn to before me this 5th day of April, A. D. 1886.

F. D. MONCKTON,
Commissioner of U. S. Circuit Court,
District of California.

Endorsed: Service of the within answer and receipt of a copy thereof admitted this 8th day of April, 1886. Scrivner, Boone & W. M. Eccles, solicitors for plaintiffs. Filed 8th day of April, A. D. 1886. L. S. B. Sawyer, clerk.

24 *Replication to Answer.*

UNITED STATES OF AMERICA:

Circuit Court of the United States, Ninth Circuit, District of California.

PHILIP MEDART and WILLIAM MEDART, Complainants,
vs.
RISDON IRON AND LOCOMOTIVE WORKS, WILLIAM H. TAYLOR, and JOSEPH MOORE, Defendants. } No. 3805.

The replication of complainants to the answer of defendants.

These repliants, saving and reserving to themselves now *now* and at all times hereafter all and all manner of benefit and advantage of exception which may be had or taken to the manifold insufficiencies of the answer of the defendants, for replication thereunto saith that they will aver, maintain, and prove said bill to be true, certain, and sufficient in the law to be answered unto, and that the said answer of the defendants is uncertain, untrue, and insufficient to be replied unto by these repliants; that any other matter or thing whatsoever in the said answer of defendants contained material or effectual in the law to be replied unto and not herein and hereby well and sufficiently replied unto, confessed and avoided, traversed or denied, is true.

All of which matters and things these repliants are now
25 and will be ready to aver, maintain, and prove as this honorable court shall direct, and humbly pray as in and by their said bill they have already prayed.

WM. M. ECCLES AND
SCRIVNER & BOONE,
Solicitors for Complainants.

Endorsed: Service and receipt of a copy of within replication admitted this 29th day of April, 1886. M. A. Wheaton, attorney for def'ts. Filed April 29, 1886. L. S. B. Sawyer, clerk.

26 *Interlocutory Decree.*

In the United States Circuit Court, Northern District of California.

PHILIP MEDART and WILLIAM MEDART, Complainants,
vs.
RISDON IRON AND LOCOMOTIVE WORKS, William H. Taylor, and Joseph Moore, Defendants. } In Equity. No. 3805.

Decree.

This cause came on to be heard upon the proofs, evidence, and pleadings before Hon. Lorenzo Sawyer, judge, and having been fully argued by counsel for both complainants and defendants, and the court having fully considered the cause as to the law and the

evidence, and the court having thereupon decided the case in favor of the complainants and against the defendants The Risdon Iron and Locomotive Works on the tenth day of June, 1890:

Now, therefore, the court, as on full consideration hath heretofore found, adjudged, ordered, and decreed, doth hereby find, adjudge, order and decree as follows:

I.

That the defendant Risdon Iron and Locomotive Works is a corporation, as stated in the bill of complaint.

II.

That patent No. 238,702, granted by the United States of America to William Medart and Philip Medart, the complainants herein, for improvements in belt pulleys, and dated March 8th, 1881, is
27 a good and valid patent, and that said Philip Medart is the original, first, and sole inventor of the improvements therein described and claimed; that the same displays patentable invention, and that said patent is the property of the complainants, and that the said defendant has infringed the first claim of said patent and the exclusive rights of the complainants by the manufacture and sale by it of wrought-metal-rimmed pulleys containing and embodying the invention described or substantially described in the specifications of said patent and claimed or substantially claimed in the first claim thereof, and by the manufacture and sale by it of a "wrought-metal-rimmed pulley having a crown formed on its rim by bending or dishing the rim during the process of manufacture," and by the manufacture and sale by it of a wrought-metal-rimmed pulley having the rim thereof bent concave and convex in cross-section.

III.

That patent No. 248,598, granted by the United States of America to William Medart and Philip Medart, the complainants herein, for improvements in belt pulleys, and dated October 25th, 1881, is a good and valid patent and displays patentable invention; that Philip Medart is the first, original, and sole inventor of the improvement therein described and claimed, and that it is the property of the complainants, and that they are entitled to the exclusive rights therein granted; that the said defendant has infringed the first claim of said patent by the manufacture and sale of belt pulleys embodying and containing the invention and improvements described or substantially described in said specification and claimed or substantially claimed in said first claim thereof and by the manufacture and sale of belt pulleys "having the ends of
28 the spider arms ground off concentrically with the axis of the pulley," and also has infringed the second claim of said patent by the manufacture and sale of belt pulleys embodying and containing the invention and improvements described or substantially described in said specification and claimed or substan-

tially claimed in said second claim of said patent, and by the manufacture and sale of belt pulleys " in which the rim and the ends of the spider arms are ground off concentrically with the axis of the pulley."

IV.

That patent No. 248,599, granted by the United States of America to Philip Medart and William Medart, the complainants herein, for improvements in the manufacture of belt pulleys, and dated October 25th, 1881, is a good and valid patent, displays patentable invention, is the property of the complainants, and that they are entitled to the exclusive privilege and rights therein granted; that the said defendant has infringed the first claim of said patent by manufacturing belt pulleys in accordance with or substantially in accordance with that described in the specification and claimed in the first claim thereof, and " by making belt-pulleys spiders by centering the pulley center or spider and then grinding the same concentric with the axis of the pulley."

And the said defendant has also infringed the second claim of said patent by manufacturing belt pulleys in accordance with that described in the specification and claimed in the second claim of said patent, and by manufacturing pulleys " by centering the pulley center or spider, boring it, grinding it concentrically with the axis of the pulley, and then securing the rim thereto."

And that the said defendant has infringed the third claim of said patent by manufacturing belt pulleys made in accord-
29 ance or substantially in accordance with that described in the specification and claimed in the third claim of said patent, and by making belt pulleys by " centering the pulley center or spider, boring the hub thereof, grinding the center or spider concentric with the axis of the pulley, securing the rim thereto, grinding the face of the rim concentric with the axis of the pulley, and then grinding or squaring the edge of the rim or substantially doing the same."

And it is further ordered, adjudged, and decreed that the complainants recover of the defendant The Risdon Iron and Locomotive Works, a corporation, all the profits, gains, and advantages which the said defendant has received or made or realized, or which have accrued to it or are to accrue to it from the infringement of either or all of the patents aforesaid, and that in addition they recover of the defendant all damages sustained by the complainants by reason of the infringement or infringements aforesaid, and that the defendant pay the costs of this case and have execution therefor.

And it is further ordered and decreed that the case be referred to Hon. Stephen C. Houghton, as master, by the court to take and present to this honorable court an account of all the profits and damages aforesaid, according to law, accruing to the complainants by reason of any and all of the infringements aforesaid.

And it is further ordered, adjudged, and decreed that a perpetual injunction issue in this case forthwith against the defendant herein,

The Risdon Iron and Locomotive Works, a corporation, and that said corporation be restrained and enjoined, together with its officers, successors, and assigns, and its agents, attorneys, clerks, servants, and employees, and all persons acting by and under its authority or direction or by the authority and direction of any
30 officer thereof, from infringeing or counterfeiting or attempting to infringe any or all of said patents and claims thereof as aforesaid, and restraining and enjoining said corporation and those acting by its authority or direction from making, using, or selling or advertising or offering to sell or in any way disposing of or offering to dispose of belt pulleys containing or embodying any of the inventions or improvements described or substantially described in the specifications and claimed in the first claim of letters patent No. 238,702, dated March 8th, 1881, and especially from making or selling a "wrought-metal-rimmed pulley having a crown formed on its rim by 'bending or dishing the rim,'" or any imitation or substantial equivalent thereof, and from selling such rim attached or separate from belt-pulley spiders or centers to be used on belt pulleys, and from making or selling wrought-metal rims for belt pulleys bent, concave, and convex in cro*aa*-section, and from making, using, or selling a "wrought-metal-rimmed pulley having a crown formed on its rim by bending or dishing the rim during the process of manufacture," either with and attached to the pulley centers or separate therefrom to be so attached.

And the said corporation is also restrained and enjoined from making, using, or selling any belt pulleys containing the invention or inventions substantially as described in the specification and claimed in any or all of the claims of patent No. 248,598, to the complainants, dated October 25th, 1881, or any imitation or substantial equivalent thereof constructed substantially as described in said specifications and claimed in said claims, and especially from making, using, or selling belt pulleys or any parts thereof "having the ends of the spider arms ground off concentrically with the axis of the pulley," or any imitation or counterfeit thereof, and from making or selling such spiders so made to have rims attached
31 thereto for belt pulleys, and from making or selling belt pulleys "in which the rim and ends of the spider arms are ground of concentrically with the axis of the pulley," or any imitation or counterfeit thereof.

And said corporation is also enjoined from making, using, or selling belt pulleys containing the invention or inventions or made in the manner substantially as described in the specification and claimed in the first, second, and third claims of patent No. 248,599, granted to the complainants herein and dated October 25th, 1881, or any of said claims or any imitation or substantial equivalent manner of construction thereof, and especially is said corporation restrained and enjoined from manufacturing belt-pulley spiders by "centering the pulley center or spider, boring it, grinding it concentrically with the axis of the pulley, and then securing a rim thereto;" and also from manufacturing belt pulleys by "centering the pulley center or spider, boring the hub thereof, grinding the center or spider

concentric with the axis of the pulley, and securing the rim thereto;" and also from manufacturing belt pulleys by "centering the pulley center or spider, boring the hub thereof, grinding the center or spider concentric with the axis of the pulley, securing the rim thereto, grinding the face of the rim concentric with the axis of the pulley, and then grinding or squaring the edges of the rim."

All pursuant to the prayer of said bill of complaint.

(Signed) LORENZO SAWYER,
Circuit Judge.

This decree is O. K.
M. A. WHEATON,
Per KIERCE.

Endorsed: Filed and entered August 26, 1890. L. S. B. Sawyer, clerk.

32 *Enrollment.*

In the Circuit Court of the United States, Ninth Circuit, Northern District of California.

PHILIP MEDART and WM. MEDART, Complainants,
vs.
RISDON IRON AND LOCOMOTIVE WORKS *et al.*, Respondents. } No. 3805.

The complainants filed their bill of complaint herein on the 3rd day of August, 1885, which is hereto annexed.

A subpœna to appear and answer in said cause was thereupon issued, returnable on the seventh day of September, A. D. 1885, which is hereto annexed.

The respondents appeared herein on the 3rd day of September, 1885, by M. A. Wheaton, Esq., their solicitor.

On the 9th day of October, 1885, a demurrer was filed herein, which is hereto annexed.

On the 15th day of March, 1886, an order overruling said demurrer was made and entered herein, a copy of which order is hereto annexed.

An answer was filed herein on the 8th day of April, 1886, and is hereto annexed.

A replication to said answer was filed herein on the 29th day of April, 1886, and is hereto annexed.

An interlocutory decree was filed and entered herein on the 26th day of August, 1890, and is hereto annexed.

Thereafter a final decree was filed and entered herein in the words and figures following, to wit:

33 *Final Decree.*

In the United States Circuit Court, Northern District of California, Ninth Judicial Circuit.

PHILIP MEDART and WILLIAM MEDART, Complainants,
vs.
RISDON IRON AND LOCOMOTIVE WORKS, William H. Taylor, and Joseph Moore, Defendants } Equity. No. 3805.

Decree.

This case came on to be heard upon the proofs, evidence, and pleadings, before Hon. Lorenzo Sawyer, judge, and, having been fully argued by counsel for both complainants and defendants, and the court having fully considered the cause as to the law and the evidence, and the court having thereupon rendered judgment in the case in favor of the complainants and against the defendant The Risdon Iron and Locomotive Works, and having, on the 26th day of August, A. D. 1890, filed its interlocutory decree herein, whereby this cause was by said decree referred to the Hon. Stephen C. Houghton, master in chancery, to take an account of all the profits and damages, according to law, accruing to the complainants by reason of the infringements complained of, and the respective parties having agreed and in writing having stipulated under said interlocutory decree that the full amount of damages sustained by the complainants herein for the infringements of the patent sued on by the defendant The Risdon Iron and Locomotive Works shall be as though adjudged to be the sum of eighteen hundred and eleven dollars and twenty-five cents ($1,811.25), which sum shall be
34 entered against the Risdon Iron and Locomotive Works as damages, together with complainants' costs, and that complainants have execution therefor, and that a final decree be entered therein, which said stipulation is now on file herein:

Now, therefore, the court, as on full consideration hath heretofore found, adjudged, ordered, and decreed, doth hereby finally adjudge, order, and decree as follows:

I.

That the defendant The Risdon Iron and Locomotive Works is a corporation, as stated in the bill of complaint.

II.

That patent No. 238,702, granted by the United States of America to William Medart and Philip Medart, the complainants herein, for improvements in belt pulleys, and dated March 8th, 1881, is a good and valid patent, and that said Philip Medart is the original, first, and sole inventor of the improvements therein described and claimed; that the same displays patentable invention, and that said patent is the property of the complainants, and that the defendant has infringed the first claim of said patent and the exclusive rights

of the complainants by the manufacture and sale by it, the said corporation, of wrought-metal-rimmed pulleys containing and em bodying the invention described or substantially described in the specification of said patent and claimed or substantially claimed in the first claim thereof, and by the manufacture and sale by it of a "wrought-metal-rimmed pulley having a crown formed on its rim by bending and dishing the rim during the process of manufacture," and by the manufacture and sale by it of a wrought-metal-rimmed pulley having the rim thereof bent concave and convex in cross-section.

III.

That patent No. 248,598, granted by the United States of America to William Medart and Philip Medart, the complainants herein, for improvements in belt pulleys, and dated October 25th,
35 1881, is a good and valid patent and displays patentable invention; that Philip Medart is the first, original, and sole inventor of the improvements therein described and claimed, and that it is the property of the complainants, and that they are entitled to the exclusive rights therein granted; that the defendant has infringed the first claim of said patent by the manufacture and sale of belt pulleys embodying and containing the invention and improvements described or substantially described in said specification and claimed or substantially claimed in said first claim thereof, and by the manufacture and sale of belt pulleys "having the ends of the spider arms ground off concentrically with the axis of the pulley; and also has infringed the second claim of said patent by the manufacture and sale of belt pulleys embodying and containing the invention and improvements described or substantially described in said specification and claimed or substantially claimed in said second claim of said patent, and by the manufacture and sale of belt pulleys "in which the rim and the ends of the spider arms are ground off concentrically with the axis of the pulley."

IV.

That patent No. 248,599, granted by the United States of America to Philip Medart and William Medart, the complainants herein, for improvements in the manufacture of belt pulleys, and dated October 25th, 1881, is a good and valid patent, displays patentable invention, is the property of the complainants, and that they are entitled to the exclusive privileges and rights therein granted; that the defendant has infringed the first claim of said patent by manufacturing belt pulleys in accordance with or substantially in accordance with that described in the specification and claimed in the first claim thereof, and "by making belt-pulley spiders by centering
36 the pulley center or spider and then grinding the same concentric with the axis of the pulley."

And the defendant has also infringed the second claim of said patent by manufacturing belt pulleys in accordance with that described in the specification and claimed in the second claim of said

patent, and by manufacturing pulleys "by centering the pulley center or spider, boring it, grinding it concentrically with the axis of the pulley, and then securing the rim thereto."

And that the defendant has infringed the third claim of said patent by manufacturing belt pulleys made in accordance or substantially in accordance with that described in the specification and claimed in the third claim of said patent, and by making belt pulleys by "centering the pulley center or spider, boring the hub thereof, grinding the center or spider con-trically with the axis of the pulley, securing the rim thereto, grinding the face of the rim concentric with the axis of the pulley, and then grinding the edges of the rim" or substantially doing the same.

And it is further ordered, adjudged, and decreed that the complainants recover of the defendant The Risdon Iron and Locomotive Works, a corporation, all the profits, gains, and advantages which the defendant has received or made or realized or which have accrued to it or are to accrue to it from the infringement of either or all of the patents aforesaid, and that in addition they recover of the defendant all damages sustained by the complainants by reason of the infringement or infringements aforesaid, stipulated by the respective parties to be and which are fixed and adjudged to be the sum of $1,811.25, together with complainants' costs, taxed at the sum of one hundred and forty-eight $\frac{55}{100}$ dollars, and that the defendant pay the costs of this case, and have execution therefor.

37. And it is further ordered, adjudged, and decreed that a perpetual injunction issue in this case forthwith against the defendant herein, The Risdon Iron and Locomotive Works, a corporation, restraining and enjoining said corporation, its officers, agents, and workmen, and each of them, together with the officers, successors, and assigns of either of them, and their agents, attorneys, clerks, servants, and employees, and all persons acting by and under their authority or direction or by the authority and direction of either of them or said corporation, from infringing or counterfeiting any or all of said patents and claims thereof as aforesaid, and restraining and enjoining them and all of them and those acting by their authority or direction from making, using, or selling or advertising or offering to sell, or in any way disposing of or offering to dispose of belt pulleys containing or embodying any of the inventions or improvements described or substantially described in the specification and claimed in the first claim of patent No. 238,702, dated March 8th, 1881, and especially from making or selling a "wrought-metal-rimmed pulley having a crown formed on its rim by bending or dishing the rim," or any imitation or substantial equivalent thereof, and from selling such rim attached or separate from belt-pulley spiders or centers to be used on belt pulleys, and from making or selling wrought-metal rims for belt pulleys bent concave and convex in cross-section, and from making, using, or selling a "wrought-metal-rimmed pulley having a crown formed on its rim by bending or diching the rim during the process of manu-

facture," either with or attached to the pulley centers or separate therefrom to be so attached.

And also restrained and enjoined from making, using, or selling any belt pulleys containing the invention or inventions substantially as described in the specification and claimed in any or
38 all of the claims of patent No. 248,598 to the complainants, dated October 25th, 1881, or any imitation or substantial equivalent thereof, constructed substantially as described in said specification and claimed in said claims, and especially from making, using, or selling belt pulleys or any parts thereof "having the ends of the spider arms ground off concentrically with the axis of the pulley" or any imitation or counterfeit thereof, and from making or selling such spiders so made to have rims attached thereto for belt pulleys, and from making or selling belt pulleys in which the rims and ends of the spider arms are ground off concentrically with the axis of the pulley or any imitation or counterfeit thereof.

And also enjoined from making, using, or selling belt pulleys containing the invention or inventions or made in the manner substantially as described in the specification and claims in the first, second, and third claims of patent No. 248,599, granted to the complainants herein and dated October 25th, 1881, or any of said claims or any imitation or substantial equivalent manner of construction thereof, and especially restrained and enjoined from manufacturing belt-pulley spiders by "centering the pulley center or spider, boring it, grinding concentrically with the axis of the pulley, and then securing a rim thereto," and also from manufacturing belt pulleys by "centering the pulley center or spider, boring the hub thereof grinding the center or spider concentric with the axis of the pulley, and securing the rim thereto," and also from manufacturing belt pulleys "by centering the pulley center or spider, boring the hub thereof, grinding the center or spider concentric with the axis of the pulley, securing the rim thereto, grinding the face of the rim concentric with the axis of the pulley, and then grinding or squaring the edges of the rim."

39 All pursuant to the prayer of said bill of complaint, and that judgment be entered in complainants' favor and against the defendant "The Risdon Iron and Locomotive Works" for the sum of $1,811.25 and for costs, and that the clerk do issue an execution therefor to the complainants.

(Signed) HAWLEY, *Judge.*

Endorsed: Filed and entered March 6th, 1891. L. S. B. Sawyer, clerk.

40 *Memorandum of Costs.*

UNITED STATES OF AMERICA:

Circuit Court of the United States, Ninth Circuit, Northern District of California.

PHILIP MEDART *et als.*, Plaintiffs,
vs.
THE RISDON IRON AND LOCOMOTIVE WORKS *et als.*, Defendants.
} Memorandum of Costs and Disbursements.

Disbursements.

Marshal's fees	$6 00
Clerk's fees	52 20
Witness fees, taking deposition of Philip Medart at St. Louis, Mo.	6 70
Examiner's fees	63 40
Docket fee	20 00
Oath to cost bill (comm'r)	25
By consent, taxed at	$148 55

L. S. B. SAWYER, *Clerk*,
By F. D. MONCKTON,
Deputy Clerk.

UNITED STATES OF AMERICA,
Northern District of California, City and County of San Francisco, } *ss.*

H. W. Mathews, being duly sworn, deposes and says that he is one of the attorneys of counsel for the complainant in the above-entitled cause, and as such is better informed relative to the above costs and disbursements than the said complainant; that the items in the above memorandum contained are correct to the best of this deponent's knowledge and belief, and that the said disburse-
41 ments have been neseccarily incurred in the said cause.

H. W. MATHEWS.

Subscribed and sworn to before me this 6th day of March, A. D. 1891.

F. D. MONCKTON,
Commissioner of U. S. Circuit —,
Northern District of California.

To M. A. Wheaton, att'y for respondent:

You will please take notice that on Monday, the 9th day of March, A. D. 1891, at the hour of 10.30 o'clock a. m., complainant will apply to the clerk of said court to have the within memorandum of

costs and disbursements taxed, pursuant to the rule of said court in such case made and provided.

WM. M. ECCLES,
Attorney for Complainants,
By ASH & MATHEWS,
Of Counsel.

Service of within memorandum of costs and disbursements and receipt of a copy thereof acknowledged this 6th day of March, A. D. 1891.

WHEATON, KALLOCH & KIERCE,
Attorneys for Respondent.

Endorsed. Filed this seventh day of March, A. D. 1891. L. S. B. Sawyer, clerk, by F. D. Monckton, deputy clerk.

42 *Certificate to Enrollment.*

Whereupon said pleadings, subpœna, copy of order, interlocutory and final decrees, and a memorandum of taxed costs are hereto annexed, said final decree being duly signed, filed, and enrolled pursuant to the practice of said circuit court.

Attest, etc.

L. S. B. SAWYER, *Clerk,*
[SEAL.] By F. D. MONCKTON,
Deputy Clerk.

Endorsed: Enrolled papers. Filed March 6th, 1891. L. S. B. Sawyer, clerk, by F. D. Monckton, deputy clerk.

43 EXHIBIT "A."

THE UNITED STATES OF AMERICA.

(Vignette.)

No. 248,599.

To all to whom these presents shall come:

Whereas Philip Medart, of St. Louis, Missouri, has presented to the Commissioner of Patents a petition praying for the grant of letters patent for an alleged new and useful improvement in the manufacture of belt pulleys, he having assigned one-half of hie right, title, and interest in said improvement to William Medart, of same place, a description of which said invention is contained in the specification, of which a copy is hereto annexed and made a part hereof, and has complied with the various requirements of the law in such cases made and provided; and whereas, upon due examination made, the said claimant is adjudged to be justly entitled to a patent under the law:

Now, therefore, these letters patent are to grant unto the said Philip Medart and William Medart, their heirs or assigns, for the

term of seventeen years from the twenty-fifth day of October, one thousand eight hundred and eighty-one, the exclusive right to make, use, and vend the said invention throughout the United States and the territories thereof.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the city of [SEAL.] Washington, this twenty-fifth day of October, in the year of our Lord one thousand eight hundred and eighty-one, and of the Independence of the United States of America the one hundred and sixth.

A. BELL,
Acting Secretary of the Interior.

Countersigned:
E. M. MARBLE,
Commissioner of Patents.

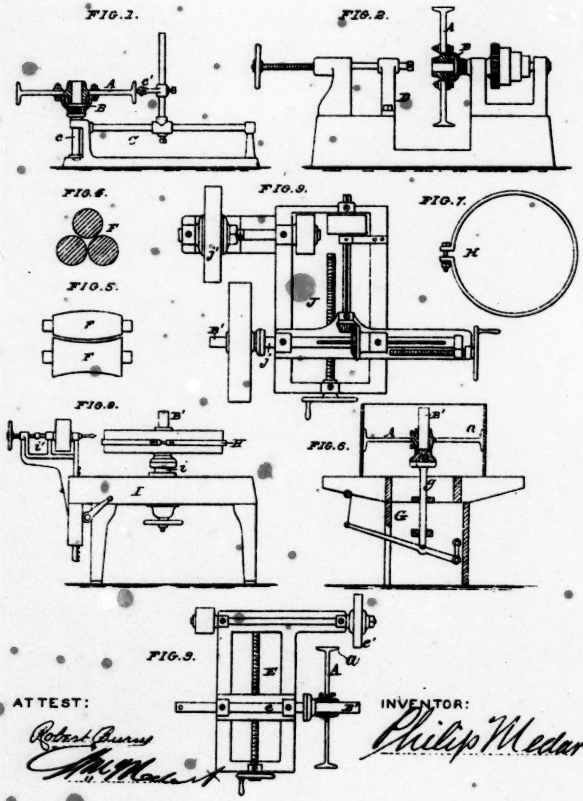
(No Model.)

P. MEDART.

MANUFACTURE OF BELT PULLEYS.

No. 248,599. Patented Oct. 25, 1881.

Exhibit "A"



ATTEST:

Robert Burns

M. M. Medart

INVENTOR:

Philip Medart

45 EXHIBIT "H."

UNITED STATES PATENT OFFICE.

PHILIP MEDART, of St. Louis, Missouri, assignor of one-half to William Medart, of same place.

Manufacture of Belt-pulleys.

Specification forming part of Letters Patent No. 248,599, dated October 25, 1881. Application filed March 15, 1881. (No model.)

To all whom it may concern:

Be it known that I, Philip Medart, of St. Louis, in the county of St. Louis and State of Missouri, have invented certain new and useful improvements in the manufacture of belt-pulleys, of which the following is a specification.

My invention relates to that class of belt-pulleys formed of a wrought-metal rim and a separate center, usually a spider, and usually made of cast metal.

Heretofore considerable difficulty has been encountered in the manufacture of such pulleys, much time, skilled labor, and large and elaborate machinery have been required, and their production has been correspondingly expensive.

The object of my invention is to cheapen and simplify their construction, overcome the objections above mentioned, and produce strong and perfect pulleys in a quick and efficient manner.

My invention therefore consists in an improved process of manufacture, whereby the above results are obtained, as will hereinafter fully be set forth.

(Here follows diagram marked p. 44.)

In the accompanying drawings, which represent the machinery for carrying out my invention, and the pulley at various stages of its manufacture, figure 1 is a view of the spider-centering machine with the spider thereon; Fig. 2, a view of the lathe for boring the central bearing of the pulley; Fig. 3, a view of the spider-grinding machine. Figs. 4 and 5 are views of the rim bending and crowning rolls; Fig. 6, a view of the table for fitting the spider to the rim; Fig. 7, a view of the clamping-rim; Fig. 8, a view of the machine for drilling the rivet-holes through the rim and the bracket-lugs on the spider-arms, and Fig. 9 a view of the grinding-machine for truing up the faces and edges of the pulley.

The manner in which I carry out my invention is as follows: The spider or center A of the pulley is secured to a chuck, B, and properly centered thereon by means of the centering-machine C, which for this purpose is provided with a vertical arbor *c*, on which the chuck screws, and an adjustable indicator arm, *c'*, to show the workman, as he turns the spider, which parts are out of center and what adjustment is required. When the spider has been properly centered it is securely clamped or bolted to the chuck. The chuck

and spider may now be secured to the arbor of the boring-lathe D and the hub bored out to the required diameter, as is well understood. I prefer to use a centering-machine, as above set forth; but it may be dispensed with, if desired, and the centering done on the lathe or mill D. The usual screw-holes can now be bored in the hub for the reception of the set-screws to secure the pulley to the shaft on which it is to be used. At this stage the spider may be removed from the chuck B and secured on the mandrel B′, which has a screw-threaded socket for screwing on the arbors of the different machines, hereinafter referred to, used in my improved process; but the arbors of these machines may be adapted to receive the chuck B; and, obviously, the boring of the hub, above described, may be deferred until the pulley is otherwise completed, or it may be done at any stage of the operation, as may be desirable and expedient. I prefer, however, to use the mandrel B′, as with it there is no danger of the spider or pulley being accidentally forced out of center during the several operations undergone in the process of manufacture. The spider is now secured to the rotatable arbor *e* of the grinding-machine E, and the ends of its arms are ground off concentric with its axis by the grinder *e′*. The rim for the pulley is bent to the required circle in suitable bending-rolls, and may be straight or crowned, as is well understood. Rolls F are shown in the drawings, Figs. 4 and 5, for giving a crown to the rim. The rim, as it comes from the rolls, is of sufficient length to allow a slight overlap in applying it to the spider, and has one end filed or finished up square, for the purpose hereinafter set forth. The spider is now transferred from the grinding-machine E to the vertically-adjustable arbor *g* of the rim-fitting table G. This arbor is vertical to the table, and being adjustable holds the spider at any required height, with the horizontal central plane of the spider parallel with the face of the fitting-table, on which the rim rests, as shown, and consequently insures an accurate fit of the rim to the spider. In the drawings the rim is shown as rolled straight, and the bracket-lugs *a* on the spider-arms correspondingly ground; but when the rim is crowned the bracket-lugs are ground to fit it.

The rim is applied to the spider in the following manner: It is placed around the spider on the fitting-table G, and firmly drawn or clamped thereon by the band H. The amount of overlap necessary to be cut off is then accurately marked on the unfinished end of the rim, the rim removed, and the overlap cut off, after which it is again placed around the spider and the band applied so as to firmly clamp the two together, the butt-joint of the rim being formed on one of the bracket-lugs. The pulley is now mounted on the rotatable arbor *i* of a drilling-machine, I, and the rivet-holes drilled through the rim and bracket-lugs. The drill-head *i′* of the drilling-machine is adjustable vertically, to drill the rivet-holes at different heights. When the drilling is completed the partly-finished pulley is removed from the machine and the rim riveted to the spider-arms. The band H is then removed, and the pulley is secured on the rotatable arbor *j* of the finishing grinding-machine J. This arbor has also an endwise and a sidewise movement, (the gears of the machine

being secured to their shafts by a groove and feather to permit of these movements, as will be understood by those familiar with this class of machinery,) which are regulated and adjusted by the screw-shafts, as shown. The face of the rim is ground off smoothly by the grinder *j'*, concentric with the axis of the pulley, and from the same center that the spider-arms were ground. The edges of the rim are now squared or trued up against the sides of the grinder, and the pulley is completed.

Pulleys thus manufactured are perfectly balanced, faultless in shape, strong and durable, and can be produced more rapidly and at less expense than the imperfect pulleys heretofore made.

The machinery herein shown and referred to has not been described more in detail, as its operation will be clear to those skilled in such matters; and no claim to it is herein made, it being my purpose to secure protection for such apparatus by other applications hereafter to be made.

I claim as my invention—

1. The herein-described improvement in the art of manufacturing belt-pulley spiders for composite belt-pulleys, which consists in centering the pulley center or spider and then grinding the same concentrically with the axis of the pulley, substantially as set forth.

2. The herein-described improvement in the art of manufacturing belt-pulleys, which consists in centering the pulley center or spider, boring it, grinding it concentrically with the axis of the pulley, and then securing the rim thereto, substantially as described.

3. The herein-described improvement in the art of manufacturing belt-pulleys, which consists in centering the pulley center or spider, boring the hub thereof, grinding the center or spider concentric with the axis of the pulley, securing the rim thereto, grinding the face of the rim concentric with the axis of the pulley, and then grinding or squaring the edges of the rim, substantially as set forth.

4. The improvement in the art of manufacturing belt-pulleys which consists in centering the pulley center or spider upon a chuck or mandrel, as herein described, and then subjecting it to the various operations in the process of manufacture without removing it therefrom, whereby all the work is done from a common center and absolute accuracy insured.

PHILIP MEDART.

Witnesses:
WM. MEDART,
ROB'T BURNS.

Endorsed: Exhibit "A." Filed October 2d, 1885. L. S. B. Sawyer, clerk, by F. D. Monckton, deputy clerk.

46 EXHIBIT "B."

THE UNITED STATES OF AMERICA.

(Vignette.)

No. 248,598.

To all to whom these presents shall come:

Whereas Philip Medart, of St. Louis, Missouri, has presented to the Commissioner of Patents a petition praying for the grant of letters patent for an alleged new and useful improvement in belt pulleys, he having assigned one-half of his right, title, and interest in said improvement to William Medart, of same place, a description of which invention is contained in the specification, of which a copy is hereto annexed and made a part hereof, and has complied with the various requirements of law in such cases made and provided; and whereas, upon due examination made, the said claimant is adjudged to be justly entitled to a patent under the law;

Now, therefore, these letters patent are to grant unto the said Philip Medart and William Medart, their heirs or assigns, for the term of seventeen years from the twenty-fifth day of October, one thousand eight hundred and eighty-one, the exclusive right to make, use, and vend the said invention throughout the United States and the territories thereof.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the city of [SEAL.] Washington, this twenty-fifth day of October, in the year of our Lord one thousand eight hundred and eighty-one, and of the Independence of the United States of America the one hundred and sixth.

A. BELL,
Acting Secretary of the Interior.

Countersigned:
E. M. MARBLE,
Commissioner of Patents.

(No. Model.)

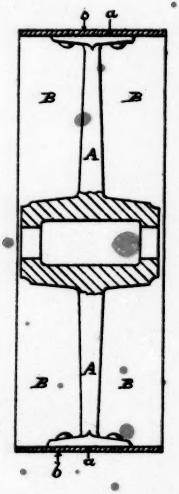
P. MEDART.

BELT PULLEY.

No. 248,598. Patented Oct. 25, 1881.

No. 164
R. & L. Works } p. 47.
Medart

Exhibit "B".



ATTEST:

Robt. Burns
Wm. Medart

INVENTOR:

Philip Medart

48 UNITED STATES PATENT OFFICE.

PHILIP MEDART, of St. Louis, Missouri, assignor of one-half to William Medart, of same place.

Belt-pulley.

Specification forming part of Letters Patent No. 248,598, dated October 25, 1881. Application filed August 29, 1881. (No model.)

To all whom it may concern:

Be it known that I, Philip Medart, a citizen of the United States, and a resident of St. Louis, in the State of Missouri, have invented certain new and useful improvements in belt-pulleys, of which the following is a specification:

My improved pulley belongs to that class of pulleys composed of a separate spider, usually of cast-metal, and a wrought-metal rim, which is secured to the spider; and my invention consists in a pulley which is perfectly true and accurately balanced—that is, a pulley in which the center of gravity and geometrical center or axis coincide.

The belt-pulleys of various kinds in use prior to the date of my invention have all been more or less open to the objection of not being accurately balanced. This defect has been inherent in their structure. Thus, while cast pulleys are of accurate shape, they cannot be practically produced of perfect balance, owing to the irregularity of the weight of the metal at different portions of the rim, and to contraction in cooling; and where pulleys of similar character to that herein shown have been made the spiders have not been properly prepared—that is, the spiders have not been operated upon so as to make the ends of their arms exactly concentric with the true center or axis of the pulley. The arms of the spider, owing to the impracticability of making perfectly accurate and smooth castings, and to contraction in cooling, will necessarily possess slight irregularities relatively to the center of the pulley, and unless these are removed and the ends of all the arms made exactly concentric with the pulley-axis the completed pulley will of necessity be imperfectly balanced. Substantially the same is true of composite pulleys of any character—that is to say, the spider, however made, will be slightly imperfect in shape, and unless the irregularities are cured before applying the rim the completed pulley will not be accurately balanced.

The advantages of having pulleys of absolute accurate balance and shape are numerous, and are so well known and sought after by those who use them that it is not deemed necessary to recite and explain them.

The accompanying drawing is a vertical section of a belt-pulley illustrating my invention.

(Here follows diagram marked p. 47.)

In making my pulley, the cast-spider A is centered and bored. The ends of the arms or the faces of the bracket-lugs *a*, upon which the rim is laid, are then ground or turned off, by any suitable machinery, exactly concentric with the axis of the pulley. By thus preparing the spider the rim B, which is rolled perfectly true and uniform in shape, will be exactly concentric at every point with the pulley-axis when laid around the spider, and the pulley will therefore be accurately balanced. In order to make the pulley even more true in shape and perfectly balanced, I then grind the rim concentrically with the axis.

The center of gravity of a pulley thus made is brought to coincide with its geometrical center more absolutely than has heretofore been done.

It will be obvious that if the pulley-arms are not first ground off concentrically with the axis, all of the inequalities incident to the operation of casting and cooling would remain as defects in the spider, and would be greatly aggravated by the grinding of the rim, because the lengths of the spider-arms being unequal without grinding when the pulley-rim is applied and ground, it will be cut away unequally—in some portions more and in others less—making it unequal in thickness, so that the final grinding operation, in order to make the pulley perfectly circular, will greatly increase its want of balance; but by preparing the spider as above described all defects are cured and pulleys of true shape and balance are produced.

I make no claim herein to the process of making the perfectly balanced pulley; but

What I claim is—

1. The improved belt-pulley herein described, having the ends of the spider-arms ground off concentrically with the axis of the pulley.

2. The improved belt-pulley herein described, in which the rim and the ends of the spider-arms are ground off concentrically with the axis of the pulley.

In testimony whereof witness my hand, at St. Louis, Missouri, this 22d day of August, 1881.

PHILIP MEDART.

Witnesses:
WM. MEDART.
ROB'T BURNS.

Endorsed: Exhibit "B." Filed October 2d, 1885. L. S. B. Sawyer, clerk, by F. D. Monckton, deputy clerk.

49 EXHIBIT "C."

THE UNITED STATES OF AMERICA.

(Vignette.)

No. 238,702.

To all to whom these presents shall come:

Whereas Philip Medart, of St. Louis, Missouri, has presented to the Commissioner of Patents a petition praying for the grant of let-

ters patent for an alleged new and useful improvement in belt pulleys, he having assigned one-half of his right, title, and interest to William Medart, of same place, a description of which invention is contained in the specification, of which a copy is hereto annexed and made a part hereof, and has complied with the various requirements of law in such cases made and provided; and whereas, upon due examination made, the said claimant is adjudged to be justly entitled to a patent under the law:

Now, therefore, these letters patent are to grant unto the said Philip Medart and William Medart, their heirs or assigns, for the term of seventeen years from the eighth day of March, one thousand eight hundred and eighty-one, the exclusive right to make, use, and vend the said invention throughout the United States and the Territories thereof.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the city of [SEAL.] Washington, this eighth day of March, in the year of our Lord one thousand eight hundred and eighty-one, and of the Independence of the United States of America the one hundred and fifth.

A. BELL,
Acting Secretary of the Interior.

Countersigned:
E. M. MARBLE,
Commissioner of Patents.

51 UNITED STATES PATENT OFFICE.

PHILIP MEDART, of St. Louis, Missouri, assignor of one-half to William Medart, of same place.

Belt-pulley.

Specification forming part of Letters Patent No. 238,702, dated March 8, 1881. Application filed November 27, 1880. (No model.)

To all whom it may concern:

Be it known that I, Philip Medart, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful improvements in belt-pulleys; and I do hereby declare that the following is a full, clear, and exact description of the invention, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming a part of this specification, and in which—

(Here follows diagram marked p. 50.)

Figure 1 is a perspective view, and Fig. 2 is a vertical section.

This invention relates to certain improvements in belt-pulleys, and has for its object, first, the production of a cheap, light, and durable pulley; and, secondly, the production of irregular sizes of pulleys without the necessity of a separate pattern for each size of pulley required; and this invention consists, first, in constructing the usual crown or dish on the rim of wrought-metal rimmed pulleys by bending said rim transversely during the process of manufacture; secondly, the belt-pulley having arms formed of wood, preferably of a cylindrical shape, which at their inner ends rest in sockets cast on the hub, and at their outer ends are provided with bracket-lugs, to which the pin is secured by rivets or other equivalent means.

To enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to more fully describe the same.

A is the hub of the pulley, cast with radial sockets *a* to receive the inner ends of the wooden arms B of the pulley. The recesses in these sockets are preferably of a cone shape, and the ends of the arms are correspondingly shaped so as to fit the same and have a firm and strong bearing.

C are bracket-lugs attached to the outer ends of the arms B, and provided with rivet-holes for the passage of rivets, by means of which the rim D of the pulley is secured in place. The part of the arms B that enters the bracket-lugs is preferably reduced in size, so as to form a shoulder, *b*, on which the lug rests, as clearly indicated in Fig. 2.

The rim D may be of any suitable material—either wrought-iron, steel, or wood—with the bracket-lugs C arranged transversely, as shown, in order to brace and support the edges of the rim and

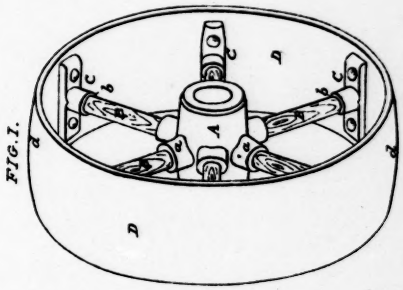
(No Model.)

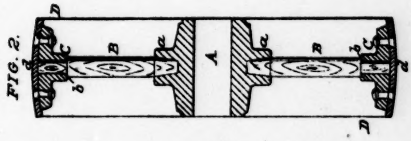
P. MEDART.
Belt Pulley.

No. 238,702. Patented March 8, 1881.

No. 16 of
R. I. L. Works
Medart
} p. 50

Exhibit "C"





ATTEST:
Robert Burns

INVENTOR:
Philip Medart

prevent the same from working loose from its attachment, which is liable to occur when the bracket-lugs are not arranged as above set forth.

The crown or dish *d* usual to belt-pulleys is formed on the rim D by bending or dishing the rim during the process of manufacture, preferably at the same time and by means of the same rolls that bend the rim into the required circular shape.

By the use of wood for forming the arms of the pulley, as above set forth, a much lighter and cheaper pulley can be produced than where iron is used for said arms, and yet possess as great strength.

Having thus fully described my said invention, what I claim as new, and desire to secure by letters patent, is—

1. A wrought-metal rimmed pulley having a crown, *d*, formed on its rim during the process of manufacture, as described, and for the purpose set forth.

2. A belt-pulley provided with wooden arms B, a cast-metal hub, A, having radial sockets *a* and bracket-lugs C, for the attachment of the rim D, as described, and for the purpose set forth.

PHILIP MEDART.

In presence of—
WM. MEDART.
ROBERT BURNS.

Endorsed: "Exhibit C." Filed October 2d, 1885. L. S. B. Sawyer, clerk, by F. D. Monckton, deputy clerk.

52 *Deposition of Philip Medart.*

U. S. Circuit Court, District of California.

PHILIP MEDART *et al.*
vs.
RISDON IRON & LOCOMOTIVE WORKS *et al.*

UNITED STATES OF AMERICA,
Eastern District of Missouri, State of Missouri, } *ss:*
City of St. Louis,

Be it remembered that on this 5th day of October, in the year of our Lord, 1886, I, Paul F. Coste, a notary public in and for the city of St. Louis and State of Missouri, by consent of the parties to the above-entitled cause, by and through their respective attorneys, William M. Eccles, for complainant and Milton A. Wheaton, for the defendants, who appeared before me, at the office of William M. Eccles (southeast corner Fifth & Olive streets), in the city of St. Louis and in the said district, Philip Medart, to testify and the truth to say on the part and behalf of the complainant in a certain suit or matter of controversy now depending and undetermined in the circuit court of the United States for the district of California, wherein Philip Medart *et al.* are complainants and The Risdon Iron and Locomotive Works *et al.* are defendants; and the said Philip

Medart, being about the age of forty-eight (48) years, and
53 having been by me cautioned and sworn to testify the truth, the whole truth, and nothing but the truth in the matter of the controversy aforesaid, I did carefully examine the said PHILIP MEDART, and he did thereupon depose and testify as follows, to wit:

1 Q. State your name, age, residence, & occupation.

A. Philip Medart; my age is 48 years; I reside at 1816 Rubger street, in St. Louis, Mo., and my occupation is manufacturer of belt pulleys.

2 Q. How long have you lived in St. Louis?

A. I was born in St. Louis and was away from St. Louis only 15 years—between my 3rd & 18th years—& have lived here ever since.

3 Q. Were you in San Francisco this summer? If so, state when.

A. I was in San Francisco in August.

4 Q. Did you visit the shop of Clatt and Muce in San Francisco when you were there?

A. Yes, sir.

5 Q. Did they show you a pulley there at that time?

A. Yes, sir.

6 Q. What pulley did they represent it to be?

A. They represented it to be the pully manufactured by the Risdon Iron & Locomotive Works.

7 Q. Where did they get the pulley & how did they come to get it?

A. They told me that they bought it from the Risdon Iron & Locomotive Works. They bought it for the reason to know how they made their pulleys.

8 Q. At whose request did they buy it?

A. They were requested to buy it by our firm, Medart
54 Patent Pulley Co.

9 Q. State whether or not you made a careful examination of that pulley at that time.

A. I did.

10 Q. Can you tell from that examination how that pulley was made; &, if so, how was it made?

A. I can. It was with a spider and with lugs on the ends of the arms that were ground concentrically and a wrought-iron rim or band attached and ground concentrically also with the axis or bore.

11 Q. Were the ends of the arms ground off concentrically with the bore?

A. Yes, sir.

12 Q. Was the rim crowned & bent in a circle at the same time on that pulley?

A. I would judge from the appearance that it was crowned & bent to a circle at the same time or one operation. My experi-nce is that a rim cannot be crowned & bent to a circle in any other way than by one operation. If the rim should be bent to a crown first

and then bent to a circle it would show kinks on the edges, and if it was bent to a circle first and crowned afterwards it would to a certain degree straighten out.

13 Q. Was it or was it not then made after the same process as your pulleys are made?

A. I judge that it was.

14 Q. How do you by your process gain an advantage over other pulleys?

A. By casting the spider without the rim it leaves the arms without any shrinkage strains and by grinding the ends
55 of the arms concentrically with the axis and attaching the rim and grinding it also concentrically with the same axis we get a light, strong, & well-balanced pulley.

15 Q. What advantage is there in grinding every portion of the bearing surface of the ends of the arms concentrically with the centre?

A. In attaching the rim to a spider ground that way it forms the outer surface of the rim to a true circle. I would say that if those lugs were not ground to a true circle the rim, being attached and ground to a true circle, would leave it of uneven thickness.

16 Q. If every portion of the bearing surface of the end of the arm is ground an equal distance from the centre what benefit will it be or what function will it perform when you use a very thin rim or one that is not bent to an exact circle before it is attached?

A. It would bring that rim to a circle and also stiffen the rim by being well fitted to the bearing.

17 Q. From your answer am I to understand, then, that these lugs thus ground concentrically form a base to hold the rim in a circle, or am I not, as far as that portion of the arc of the circle is concerned?

A. Yes, sir; they do.

18 Q. Did or did not this pulley which you saw in San Francisco in August last possess the same qualities which you have above spoken of?

A. Yes, sir; it did.

19 Q. What advantage, if any, is there in constructing pulleys with a rim convex on one side & concave on the other as you construct them under your patents and the ordinary cast-
56 iron pulleys?

A. The rim is much thinner, with the same strength, being of wrought iron, and in that shape has a tendency to stiffen it. A cast-iron rim cannot practically be moulded in that shape, because it would not draw from the mould or sand, and also that the rim is free from shrinkage strains when made of wrought iron—a defect inherent in a rim of cast iron.

20 Q. In constructing them, I mean the rims, hollowed out on the under surface of the rim and crowned on the outer surface of the rim, what advantage have you as the manufacturer of pulleys, over a rim that is straight on the under surface & crowned on the outer surface?

A. We make the rim of less material and get the same strength.

The difference in the material would be nearly that portion which would be taken out or which would lie between a straight line from edge to edge of the rim and the curve in the under portion of the rim. This of course makes the rim lighter & cheaper than a rim with a straight under surface.

21 Q. Will a pulley made in this manner, after your patents, be less liable to fly asunder or break than an ordinary cast-iron pulley—and, if so, why—by rapid revolution?

A. It would be less liable for the reason that the rim is made of wrought iron rolled to an even thickness, which, when attached to the arms that were ground concentrically to the axis and the rim also ground concentrically to the same axis leaves the rim a well balanced portion of the pulley, without any shrinkage strains
57 which a cast-iron pulley has or is liable to have.

22 Q. How many pulleys have you sold since you began the manufacture under your patent & in accordance therewith? Give us as near as you can approximate.

A. We have sold about two hundred thousand since we began—that is, in the last seven years.

23 Q. State what efforts you have made and what money you have expended in putting your patent pulleys before the people.

A. When I first conceived the idea of making a compound pulley I thought that I could make a marketable pulley by having the spider cast from a pattern that was perfectly true and by attaching the rim without finishing or grinding the lugs or the face of the pulley. After constructing a number of them I found that pulleys so made would not run true or be well balanced, for the reason that the arms would not shrink alike or the moulder in forming a mould for a casting would wrap them more to one side than another and would also ram the same harder at one place than another, which has a tendency to cause unequal shrinkage and leave the ends of the arms out of true. It would be liable to leave the bearings for the rim too high on one side and too low on the other or in a shape that would not fit the rim. I have found it necessary to make a machine to grind those ends or bearings concentrically to the axis and also a machine for grinding the face of the pulley concentrically with the same axis. This was the result of my experiments & study on this pulley.

24 Q. How long were you experimenting & studying on this pulley before you struck upon this concentric grinding?
58 A. I believe it was about a year.

25 Q. Your experiments then with cast-iron spiders & a wrought-iron rim without grinding the arms concentrically with the axis resulted in a failure to make a merchantable & practical pulley, did it not?

A. Yes, sir; it did.

26 Q. And you only arrived at a merchantable & practical composite pulley, as I understand you, after you conceived the idea & carried it into practice of grinding the arms off concentrically with the centre?

A. Yes, sir.

27 Q. State what effort & money you have expended in addition to what you have already stated in advertising your pulley & putting it before the people.

A. I don't know the exact figures, but I am satisfied we have spent at least thirty thousand dollars in advertising and putting it before the people. I am satisfied it would come up to that figure.

28 Q. State what effect your pulley has had upon the trade since you began to manufacture the pulley in regard to cheapening pulleys.

A. The price of pulleys at the present time is fully one hundred per cent. less than it was at the time we began making pulleys under our patent, seven years ago. I know iron was very cheap about that time. I paid $2.25 per 100 lbs. for the first rim iron; that rim iron now sells at $2.40. I attribute the cheapness to the competition of pulleys since we began. We sold pulleys at a less price than cast-iron pulleys were sold for at the time in order to get the trade in that line and for the reason that we were enabled
59 to make our pulley for less money, it being a pulley 40 per cent. lighter than the cast-iron pulley.

29 Q. State whether in your opinion the Risdon Iron & Locomotive Works by the manufacture of the pulley which you saw in San Francisco are infringing your patents sued on.

(Objected to because it is incompetent. The question of infringement is a question of fact for the court to decide & upon which the opinion of an expert or any other witness cannot be taken or considered.)

A. Yes, sir; I believe they do.

30 Q. State how & to what extent the defendants have damaged you by the manufacture of pulleys in San Francisco after the pattern of the one that you saw.

A. I would say that when they started to manufacture that pulley & put it in the market *are* licensees were doing a large and growing business which has since then dropped off to about ⅓. I know this from information from our licensees & their reports. We are put to the expense of this suit also.

The arms of the spider in the pulley I saw in San Francisco, which I mentioned in the beginning of my examination, were of wrought iron.

No cross-examination.

PHILIP MEDART.

Sworn to and subscribed before me this 5th day of October, 1886.

[SEAL.] PAUL F. COSTE,
Notary Public, City of St. Louis, Mo.

60 UNITED STATES OF AMERICA,
Eastern District of Missouri, State of Missouri, } *ss:*
City of St. Louis,

I, Paul F. Coste, do certify that on October 5th, A. D. 1886, I was attended at the office of Wm. M. Eccles (S. E. corner Fifth & Olive

streets), in the city of St. Louis, in said State and district, by Wm. M. Eccles, solicitor for complainants, & Milton A. Wheaton, solicitor for defendants, and the witness, Philip Medart, who was of sound mind and lawful age, and said witness was by me carefully examined & cautioned and sworn to testify the truth, the whole truth, and nothing but the truth, and his deposition was by me reduced to writing in the presence of said witness and from his statements, and after carefully reading the same to the witness, he subscribed the same in my presence. I have retained the said deposition in my possession for the purpose of sealing up & directing the same, with the certificate thereto, & transmitting the same by mail to the clerk of the court wherein this cause is pending as aforesaid. I further certify that I am not of counsel nor attorney for either of the parties in said deposition and caption named or in anywise interested in the event of said cause named in said caption.

61 In testimony whereof I have hereunto set my hand and affixed my notarial seal this 5th day of October, A. D. 1886, & of the Independence of the United States the 110th.

[SEAL.] PAUL F. COSTE,
Notary Public.

Fees, $6.70.
Paid by pl'ff.
PAUL F. COSTE, *N. P.*

Endorsed: Opened and refiled July 22d, 1889. L. S. B. Sawyer, clerk, by F. D. Monckton, deputy clerk.

62 In the Circuit Court of the United States for the Ninth Judicial Circuit in and for the District of California.

PHILIP MEDART *et al.*, Complainant,
vs.
RISDON IRON AND LOCOMOTIVE WORKS *et al.*, Respondent.
} In Equity. No. 3805.

Caption to Depositions.

Be it remembered that, on the 23rd day of July, A. D. 1889, and on the several days thereafter to which the examination was regularly adjourned, as hereinafter set forth, at my office, room 57, in the United States Appraisers' building, on the northeast corner of Washington and Sansome streets, in the city and county of San Francisco, State of California, before me, S. C. Houghton, examiner in chancery of the circuit court of the United States for the ninth circuit and district of California, personally appeared the several witnesses, whose names are hereinafter set forth, who were produced and examined on behalf of the respective parties to the above-entitled cause.

Wm. M. Eccles, Esquire, appeared as counsel on behalf of complainant-, and M. A. Wheaton, Esquire, as counsel on behalf of respondent-.

The following is a record of the proceedings:

63 *Deposition of Constant Meese.*

TUESDAY, *July* 23*rd*, 1889.

Present: Mr. Eccles, of counsel for complainant-; Mr. Wheaton, of counsel for respondents.

Examination-in-chief of CONSTANT MEESE on behalf of complainant-.

(By Mr. ECCLES:)

Q. 1. State your name, age, place of residence, and occupation.

A. My name is Constant Meese; my age, thirty-three years; I reside in Oakland, and am by occupation a manufacturer of machinery in San Francisco.

Q. 2. Counsel for the complain-t- shows the witness a circular and asks the witness what it is and where he procured it.

A. This circular is one of the Risdon Iron and Locomotive Works' circulars giving the prices of pulleys.

(It is admitted by respondent that the circular referred to was published and circulated by the respondent prior to the institution of this suit and also subsequent thereto.

(The circular referred to is introduced in evidence by complainant- and marked "Complainants' Exhibit Circular.")

Q. 3. Complainants' counsel shows the witness a pulley and
64 asks the witness to examine it and state where it came from.

A. The pulley exhibited came from the Risdon Iron and Locomotive Works, and was purchased by me from the Risdon Iron and Locomotive Works.

Q. 4. When?

A. This pulley I purchased from the Risdon Iron and Locomotive Works, respondent, about three years ago.

Q. 5. Did you ever purchase any other similar pulleys from the Risdon Iron and Locomotive Works?

A. I did.

Q. 6. State if you ever saw this bill before which I now show you.

A. I have seen this bill.

Q. 7. What is that a bill for?

A. This is a bill for an eighteen by six-inch pulley purchased by me from the Risdon Iron and Locomotive Works about January 30th, 1888.

Q. 8. How did that pulley purchased by you at that time differ from the one before you?

A. In being a narrower face and smaller diameter.

Q. 9. Only?

A. "Only" I couldn't state; it may be a different bore, and it may have been a straight-faced pulley.

(Counsel for complainant- introduces in evidence the pulley above

referred to by the witness, which was marked "Complainants' Exhibit Respondents' Pulley.)

(Counsel for complainant introduces the bill above referred to in evidence, which is marked "Complainants' Exhibit Respondents' Bill.")

Q. 10. What is the name of your firm, Mr. Meese, in the city of San Francisco? What is the title, I mean?

A. Clot & Meese.

65 Q. 11. How long have you been engaged in the manufacture of pulleys?

A. That I couldn't state.

Q. 12. Oh, about how long? We are not particular about the dates.

A. About five years—four or five years.

Q. 13. State whether or not you are the licensees of the complainant in this case in the manufacture of pulleys.

A. We are such licensees.

Q. 14. How long have you been manufacturing the complainants' pulley under such license—about how long?

A. For about four or five years last past.

Q. 15. State whether or not you have examined the pulley marked "Complainants' Exhibit Respondents' Pulley" with reference to determining how it was made.

A. We have examined the pulley by detaching one of the arms and bending it and examining the face of the arm.

Q. 17. Will you state whether, in your opinion, those arms on that pulley were ground concentrically with the center before attaching the rim?

A. In my opinion, those arms were ground concentrically with the center before attaching it to the rim.

Q. 18. State whether, in your opinion, the rim in that pulley was crowned and bent into a circle before attaching it to the arms at one and the same time.

A. In my opinion, it was.

66 Cross-examination of CONSTANT MEESE.

(By Mr. WHEATON:)

Q. 1. So far as you know, the defendant in this case has never made any pulleys with wooden arms, has *he?*

A. So far as I know, it has not.

Q. 2. How long have you been acquainted with the manufacture of pulleys having wrought-metal rims?

A. About four or five years.

Q. 3. Then, personally, you do not know how pulleys were manufactured with wrought-metal rims prior to the year 1880, do you?

A. No; I do not.

Q. 4. What difference does it make whether the ends of the arms are made concentric with the center of the pulley by grinding or

whether they are so made concentric by any other method, such as turning or filing?

A. It makes no difference so far as the quality of the pulley is concerned, but in economy of workmanship it makes a difference.

Q. 5. When the pulley is finished would there be any difference in the value of it whether the ends of the arms were made concentric by some one of the methods mentioned or by one of the others—that is, whether they were made concentric by grinding or by turning or by filing or by dressing with a *coal*-chisel or by any of the other well-known methods of shaping iron?

A. As a pulley, they would be of the same value if made perfectly concentric by either method.

67 Q. 6. Will you please name over such as you can of the well-known methods of shaping iron which were commonly practiced by metal manufacturers long prior to the year 1880?

A. Iron was shaped into form by turning, planing, filing, and chipping with a *coal*-chisel.

Q. 7. Haven't you seen metal ground into shape ever since you were a boy?

A. I have.

Q. 8. In fact, was not grinding the very commonest method of shaping metal that you ever did know of prior to 1880?

A. I should not think so, from my experience; it was more used for finishing.

Q. 9. Was not the grindstone for grinding metal a common implement with almost every farmer throughout the United States?

A. It was.

Q. 10. As well as with every mechanic?

A. It was.

Q. 11. Did not the grinding of the metal always change its shape?

A. It did.

Q. 12. Now, in your judgment, would it have required invention, even as far back as 1875, to have ground metal into any desired form—that is, into any ordinary form that might be desired?

Mr. Eccles: Complainant objects to that question because it tends to mislead the witness and because it is irrelevant.

A. I don't understand that question.

Q. 13. Well, I will change the form of it so I think you will understand it. In your judgment, as far back as 1875, would
68 skilled mechanics know how to grind off the ends of metal arms concentric with the center about which they revolved?

(Question objected to by complainant as irrelevant.)

A. In my opinion, they would not.

Q. 14. Why not?

A. Because I have an idea it was never thought of to grind metal arms concentric with a center.

Q. 15. Well, do you know anything about how that was?

A. How what was?

Q. 16. Do you know how the ends of the arms were made concentric with the center, about which they revolved, prior to 1875, of your own knowledge?

A. Of my own knowledge, if such arms were required for anything of that sort they were put on a lathe and turned, or else filed with a file, being first chipped with a chisel and hammer. I never heard of or saw the ends ground off before that time.

Q. 17. Did you not prior to that time know of car wheels being ground concentric with the center of the axles upon which they were fixed—that is, the rims of the car wheels—prior to 1880?

A. I do not remember of that being done.

Q. 18. Suppose that it was done, would there be any difference in the mechanical knowledge required to grind the rims of those car wheels concentric with the center of the axle on which they were fixed and the mechanical knowledge which would be required to grind the ends of the arms of a pulley concentric with the center about which it revolved?

69 Mr. ECCLES: That question is objected to as calling for a legal conclusion and not for a question of facts.

A. There would be a little difference, as the grinding off of the ends of the arms requires more attention.

Q. 19. What would that increased amount of attention required have to do with the mechanical knowledge that was required in each case?

A. It would have to be a person who was more careful—who could be relied upon more—in the case of grinding off the arms of the pulleys.

Q. 20. Well, does it necessarily follow that it requires a larger amount of mechanical knowledge to perform an operation with more delicate machinery than it does to perform the same or an analagous operation with heavier machinery or upon heavier devices simply because the one requires more careful attention than the other?

A. It does naturally follow.

Q. 21. Well, do you mean to testify that in your judgment a skilled mechanic who had ground the rim of car wheels concentric with the center about which they revolved might not know how to grind off the ends of metal arms concentric with the center about which they revolve?

A. In my judgment, a mechanic having ground off the faces of car wheels could not grind off the ends of pulley arms successfully until he had acquired sufficient skill to do it.

Q. 22. I have not inquired about skill, but simply common
70 mechanical knowledge. Now, do you think it possible that a man after practicing the grinding off of the peripherys of the car wheels concentric with the center about which they revolve could not know how to grind off the ends of metal arms concentric with the center about which they revolve?

A. I am not prepared to answer that question.

Q. 23. The specifications of one of the patents sued on uses this

expression: "And this invention consists, first, in constructing the usual crown or dish on the rim of wrought-metal pulleys by bending said rim transversely during the process of manufacture." Now, I will inquire of you, as a mechanic, whether it is possible, or ever was possible, to put the usual crown or dish on the rim of wrought-metal pulleys except during the process of manufacturing that rim?

Mr. ECCLES: That is objected to for the reason that the witness is asked to construe the patent, which is alone a question for the court.

A. I do not know whether it is possible or was possible.

Q. 24. Can you conceive how it would be possible to manufacture a crown or dish on the rim of a wrought-metal crowned or dished pulley without putting a crown or dish on the pulley while the crowned or dished pulley was being made?

A. The only way that I know of putting a crown on a pulley would be to turn it on after the pulley was built.

Q. 25. It would not be a crowned pulley, would it, until that crowned pulley was turned on, in such case?

71 A. It would not be a crowned pulley until that crown was turned on.

Q. 26. And in that case the crown would be turned on during the manufacture of such crowned-rim pulley, would it not?

A. I am not prepared to answer that question.

(Respondent introduces in evidence copy of English letters patent No. 2081, granted June 12, 1873, to Robert Mathers, for improvements in the construction of driving drums, strap pulleys, or ribbons, marked "Respondents' Exhibit Mathers Patent.")

(Respondent also introduces in evidence copy of English letters patent No. 4465, granted November 1st, 1879, to Richard Russell Gubbi*b*s, for an improved portable wheel, marked "Respondents' Exhibit Gubbins Patent.")

(The complainant- admits that the copies of the Mathers and Gibbins patents introduced by respondent are correct copies, subject, however, to correction by the introduction of certified copies.)

Re-examination of CONSTANT MEESE.

(By Mr. ECCLES:)

Q. 1. Mr. Meese, suppose you would take the crab on that pulley (which consists of the hub and the arms) before it was ground

72 off and put it on a shaft and set an ordinary mechanic to turning those arms off concentrically with the center by means of a turning lathe, what would be the result? Could it or could it not be done by such lathe in that manner without supporting the arms of the crab?

A. It could not be done without supporting the arms of the crab.

Q. 2. But it can be ground without supporting the arms?

A. Yes, sir; it can be ground without supporting the arms of the crab.

Q. 3. Why couldn't it be done in a lathe? The lathe would catch the arms, wouldn't it?

A. The tool would catch the arms.

Q. 4. And it would stop and jerk?

A. It would break the arms off.

(By agreement of counsel, the reading of the above deposition to the witness and the signing of the same by him are waived.)

(Examination continued, subject to agreement and notice.)

73 *Deposition of Wm. H. Birch.*

SATURDAY, *August 3rd*, 1889.

Present: Mr. Eccles, of counsel for complainant-; Mr. Wheaton, of counsel for respondent.

Examination-in-chief of WILLIAM H. BIRCH on behalf of respondent.

(By Mr. WHEATON:)

Q. 1. State your name, age, place of residence, and occupation.

A. My name is William H. Birch; my age, fifty-eight years; I reside in San Francisco, and I am by occupation proprietor of machine works, and doing business in this city at 119 Beale street.

Q. 2. What is the name of the firm to which you belong?

A. The California machine works.

Q. 3. How long have you been a practical machinist?

A. Well, it is about forty-two years since I first went into the business.

Q. 4. How long have you carried on a foundry and machine business in San Francisco?

A. For myself, it is about fifteen years. I first went to work at the Vulcan iron works as a machinist in May, 1852, I think it was; it was either in April or May, 1852; that would be thirty-six years last May.

Q. 5. How long have you known of belt pulleys being manufactured with wrought-iron rims?

74 A. I think the first that I noticed was in 1853. At the time I was employed at the Vulcan iron works we made a number at different times from 1852 to 1856. We made a number of sizes that we didn't have patterns for.

Q. 6. When you say "we" who do you mean?

A. I mean the Vulcan Iron Works Company. Of course, I was not a partner, but I was employed there as a workman.

Q. 7. Did you assist in making those?

A. I don't remember whether I really worked on them or not, but they were in process of construction in the shop. A portion of the time I was running a lathe, and a portion of the time I was working on the vise or bench.

Q. 8. Please describe how those pulleys were made.

A. They were a wrought-iron rim rolled up and riveted to a cast-iron spider—cast-iron center. I think those pulleys, the center

of them, were somewhere from about five to six feet in diameter and from about eight inch to fifteen or eighteen inch faces; they varied that much. The spiders were made and cast, and they were bolted onto the face plate of the large lathe that they have, and the ends of the spiders were turned off, bolted onto the face plate, and after they were turned off the center was bored without moving the spider at all. Then the rims were rolled up in the boiler shop and fitted and riveted to these cast-iron spiders.

Q. 9. Please state whether or not that method of turning the ends of the arms of the spider and boring the center of the spider made the ends of the arms perfectly concentric with the center of the axis of the spider.

75 (Question objected to by complainant- as leading.)

A. It did.

Q. 10. When the pulley was finished, state whether or not it made any difference whether the ends of those arms were turned in the lathe in the manner in which you have stated or whether they had been ground with a grindstone.

A. No difference at all as long as they were true. If the work was properly done, they are more likely to be true by boring and turning the spider at the same time than they would be to take and bore at one time and grind the ends off at another time.

Q. 11. State why that is the case.

A. Because if the spider is fastened to the face plate rigidly and turned off, there is no movement can take place, there is no change, and the rim must be concentric to the center of the hub; it must be true; there is no possible way to have it wrong. If you grind it off, you grind it off in two different machines—that is, you grind it in one machine and bore it in another machine, so there is a chance of either one of those machines being untrue to a certain extent. In one case you do the whole business at one operation, and in the other case you do it in two operations.

Q 12. Please state how the rims were formed and put onto those pulleys—a little more in detail.

A. The sheet of iron was cut out the width that the pulley wanted to be on the face and the length that it required for the diameter and then they were rolled, and in the center there was
76 a narrow strip of iron put in the center so as to bring a pressure in the center of the plate, so that the pressure of the iron there would spread and naturally make the rim oval or concave on the outside.

Q. 13. On which side was that rim concave?

A. On the outside.

Q. 14. Just illustrate it with your hand.

A. (Witness does as requested.)

Q. 15. That would form a convex surface, wouldn't it? You just illustrated with your hands what would form a convex surface.

A. Oh, convex, I meant, on the outside.

Q. 16. What was the form on the inside of the rim?

A. That would be concave.

Q. 17. Now, the piece of iron which you put in a convex surface on the inside of the rim, in what position relatively to the rim was that iron placed?

A. In the center of the plate.

Q. 18. Well, did it run longitudinally or transvers-ly across it?

A. It run longitudinal with the plate.

Q. 19. Please look at the patent, "Complainants' Exhibit C," and state how the rims that you formed then compare with the rims on the wooden arm belt pulley shown in that exhibit.

Mr. ECCLES: That is objected to as not the best evidence, they having shown no pulleys manufactured in 1852.

A. Very similar to this.

77 Q. 20. What would be the difference, if any, between them?

(The same objections by complainant-.)

A. The pulleys that were made about which I have been testifying might not have been as convex on the extreme outside edges of the rim. The drawing — the patent shows a very convex face.

Q. 21. Please state what was the difference between the one in which you formed those rims and the manner described in the patent, "Exhibit C," which is as follows: "The crown or dish *d* usual to belt pulleys is formed on the rim D by bending or dishing the rim during the process of manufacture, preferably at the same time and by means of the same rolls that bend the rim into the required circular shape."

Mr. ECCLES: That is objected to because the witness is asked to construe a patent.

A. There would be no difference in the manufacture. Those that were made at the Vulcan iron works were made just like that. They were made and finished just from the rolls—at least that part of it.

Q. 22. State whether or not those that you made had the crown or dish put on them at the same time and by means of the same rolls that bent them around in a circle.

(Question objected to by complainant- as leading.)

A. They were.

Q. 23. I will now read you the description from an English patent in evidence as "Respondents' Exhibit Mathers Patent," and ask you to point out any difference there is between the description I shall read from that and the description which I

78 have read you from the patent, "Exhibit C:" "My said invention has for its object improvements in the construction of driving drums, strap pulleys, or riggers whereby greater facility is afforded for fixing and removal and convenience of packing for transmission, combined with lightness, strength, and a more even balance, and with economy in first cost. For these purposes in constructing drums, pulleys, or riggers I employ or use a set of arms,

boss, and narrow bearing rim, which may be whole or in halves. When in halves they are bolted or cottered together at the rim and boss in the usual well-known manner, the boss being bored to the size required and the periphery of the narrow bearing rim being suitably turned to receive a sheet steel or iron cover forming the driving surface. This driving surface or rim constitutes a separate band or strip of sheet iron or steel of a suitable thickness and of any breadth required, and is bent into form by passing it repeatedly through and between a pair of bending rolls of hard or chilled metal for the purpose of bringing it to the diameter required. The driving rims thus formed may be made flat or convex in cross-section by means of suitable rolls, the curvature and cold rolling greatly increasing the rigidity and improving the rim as a driving surface. The rim or cover is thus made to encircle or fit upon the turned periphery of the narrow bearing rim and arms, and has its two ends fitted and joined together by means of a butt plate or plates and bolts, or by screws or rivets, or in the manner of a clasp-hoop, with loops and cotters, so that the same may be held firmly to-
79 gether. Projections on the inner side of the driving rim, fitting into corresponding recesses in the periphery of the bearing rim or countersunk screws or bolts, may also be used to secure and retain the driving rim when in position. When a great width of driving surface is required two or more bearing rims, placed at suitable distances apart, may be used for carrying and supporting any width of driving rim required, which is to be held in position and secured by the means and in the manner before described."

Now, please state whether you understand the description which I read from the patent, "Exhibit C," as follows: "The crown or dish *d* usual to belt pulleys is formed on the rim D by bending or dishing the rim during the process of manufacture, preferably at the same time and by means of the same rolls that bend the rim into the required circular shape." Do you understand fully that description?

A. Yes, sir.

Q. 24. I will now read you the description from the English patent referred to, the Mathers patent, as follows: "This driving surface or rim constitutes a separate bend or strip of sheet iron or steel of a suitable thickness and of any breadth required, and is bent into form by passing it repeatedly through and between a pair of bending rolls of hard or chilled metal for the purpose of bringing it to the diameter required. The driving rims thus formed may be made flat or convex in cross-section by means of suitable rolls, the curvature and cold rolling greatly increasing the rigidity and improving the rim as a driving surface. The rim or
80 cover is thus made to encircle or fit upon the turned periphery of the narrow bearing rim and arms, and has its two ends fitted and jointed together by means of a butt plate or plates and bolts or by screws or rivets, or in the manner of a clasp-hoop, with loops and cotters, so that the same may be held firmly together." Do you understand that description?

Mr. Eccles: That is objected to as leading, and also on the ground that the witness is asked to construe a patent, and also on the ground that the whole of the specifications are not read to him.

A. I do.

Q. 25. Now, please point out any difference, if there is any, between this description, in which the method and means by which the rim is formed with a crown, as described in the patent, "Exhibit C," and the means or method of forming the same as described in the Mathers patent, from which I have just read.

Mr. Eccles: That is objected to on the same grounds; and, further, that the witness has not been shown to be an expert in the manufacture of pulleys.

A. There is no difference in the process of rolling and bending the rim at all. The only difference is in the language. The process is almost identically the same in both cases.

Q. 26. What difference, if any, is there in the means used—that is, the rollers described?

A. No difference at all. They are both done in the same way.

81 Q. 27. How are the rims made to encircle and how are they secured to the pulleys which were made at the Vulcan foundry which you described?

A. They were riveted to the spider. The holes were countersunk on the outside and the rims were riveted to the spider.

Q. 28. In what were the holes countersunk?

A. In the rim.

Q. 29. What part of the spider was the rim riveted to?

A. It was riveted to the lugs on the outside of the spider.

Q. 30. Do you mean by the "lugs" the ends of the arms?

A. Yes, sir; to the ends of the arms.

Q. 31. How did the manner of riveting them compare with the manner and means of riveting the ends of the rim as shown in this pulley in evidence, marked "Respondents' Exhibit Pulley"?

Mr. Eccles: That is objected to because the pulleys are not produced nor accounted for.

A. The riveting was similar to that. Of course, the lugs on the ends of the arms were different from that one.

Q. 32. How ere they different?

A. They went the other way; they were cast iron and run crosswise of the rim.

Q. 33. In this pulley in evidence, "Respondents' Exhibit Pulley," are there any transverse lugs at the ends of the arms?

A. The lugs are the opposite way, lengthwise of the rim in

82 place of crosswise.

Q. 34. How long, if at all, have you been a practical manufacturer of belt pulleys?

A. Ever since I went into the business, almost.

Q. 35. For how many years?

A. Well, nearly forty years. It would be about, I suppose, thirty-

nine or forty years that I have been making pulleys all the time—different sizes and different kinds. I have made no specialty of pulleys particularly.

Q. 36. In casting the center of the spider and putting in the arms as shown by the pulley in evidence, would any irregularities occur in the wrought-iron arms on account of their shrinking or anything of that kind while the casting was cooling?

A. Well, I think it would be very likely to. A casting don't always shrink alike on one side, and the chances are there would be quite a number of those arms of different lengths from the others, which is caused by the rapping of the mold. When they are molding this center piece, if a man raps a little harder on one side than on the other, the soft side will have more iron on that side, and consequently it will shrink more on that side and draw it out of a true circle.

Q. 38. Does that apply to the arms themselves or to the cast iron which holds the arms?

A. That applys to the cast iron.

Q. 39. Would any change occur in the wrought iron?

A. No, sir; not in the wrought iron.

83 (By Mr. ECCLES:)

Q. 40. But they would draw in and do according to the shrinkage of the hub?

A. Yes, sir; according to the shrinkage of the hub; but as far as the wrought-iron arms themselves are concerned, they would not be affected, only by the casting.

(By Mr. WHEATON:)

Q. 41. Would the weight of those arms be changed any by the casting of the center?

A. No, sir; the weight would not be changed.

Q. 42. Would the same irregularities occur in those arms when the casting of the center is made to include them—their inner ends—as would occur in a spider in which the center and arms were all cast?

A. There would be probably less liability for change in an arm cast like the model in evidence than if it were all cast iron.

Q. 43. When the arms are all cast iron, do not the arms themselves shrink unequally in length?

A. They do.

Q. 44. Will that occur where the arms are wrought iron, as like the pulley in evidence?

A. Not to so great an extent.

Q. 45. Well, I am enquiring about the arms alone?

A. No, sir; not the arms alone; they are not affected that way.

Q. 46. Where the arms are cast, will there be a different weight in the different arm resulting from the facts that you have mentioned, inequalities in tapping, and so forth?

(Question objected to by complainant- as leading.)

A. There will.

84 Q. 47. Would that inequality apply to the arms of the pulley in evidence?

A. It would not.

Q. 47½. In the pulley in evidence, does it make any difference in the pulley itself whether the outer ends of those arms are dressed concentric with the center of the axis by being ground instead of being turned or dressed by other methods known to machinists?

A. It would make no difference at all, as long as they were made true. You can make them true in a great many different ways—by grinding them, or working them on a chipping machine, or dressing them by a file, or mill them—but whatever way you do that work you take the cheapest and shortest way of doing it.

Q. 48. How long, if at all, have you known of faces of pulleys being dressed by grinding instead of by turning?

A. Oh, I have known of it—it has always been the practice in machine shops. We often get pulleys sometimes that will be so hard that we couldn't turn them, and in that case, rather than to destroy the pulley, we take and grind it off. We have had temporary arrangements for just dropping the pulley in on the mandrel and just turning it against an ordinary grindstone and grind it off. If we had anything of that kind to do we would true up the stone so as to make the surface of the stone true. We would take the arbor of the pulley and drop it into a couple of wood boxes, the wood boxes being on a slide, and sometimes we would use a lever to press it up against the grindstone, and use the hand to pull the pulley against the grindstone while it is going.

85 Q. 49. Now, in that case, did the pulley turn on the center of its own axis?

A. Yes, sir; it did—that is, on a mandrel that was put into the pulley, which would be a temporary axis it was put on for the purpose of grinding.

Q. 50. Would that be precisely the same as an arbor shaft?

(Question objected to by complainant- as leading.)

A. Just exactly.

Q. 51. How long have you practiced that method of grinding the face of pulleys yourself?

A. Well, ever since I went into business. Whenever I found it was necessary—getting a hard pulley which wouldn't turn—we would grind it.

Q. 52. Did that ever occur to you, say, prior to 1875?

(Question objected to by complainant- as leading.)

A. Oh, yes; years and years before that.

Q. 53. How extensively, to your knowledge, has that practice been followed by other foundries and machine shops for dressing the surface of hard pulleys?

A. It is the general practice among machinists for anything they couldn't turn they would grind, whether it was a pulley or a roll or anything of that kind. We had a grinding machine in the Vulcan iron works that we put up to grind the rolls for the United

States mint. That machine must have been put in there, I think, about 1860.

Mr. ECCLES: The last question and answer *is* objected to for the reason that the machine is not produced nor accounted for.

86 Q. 54. Was that the United States mint in this city?

A. Yes, sir; the machine is in the city here yet.

Q. 55. Which machine do you mean is in the city?

A. I mean this grinding machine I have spoken of, which was put up in the Vulcan iron works somewhere along about 1860, I think. I couldn't remember the exact year, but it was put up as a grinding machine just for the purpose of grinding rolls, and it was put up to grind the rolls in the United States mint here.

Q. 56. What part of the rolls in the United States mint did it grind?

A. It ground the bearings, and also the center—the rolling surface of the rolls. When the rolls were first put into this machine they were centered, a large center drill, so they would revolve on that center, and then they were brought up to the grindstone and those bearings were ground off true on each side. After those were ground off true the roll was put into two pillar blocks and the centers was taken away.

Q. 57. Those were the centers of the shaft?

A. No; the dead-center—just a pointed steel piece.

Q. 58. What were those centers in?

A. They were in the head sticks of the grinding machine. They formed the same purpose as what the centers on an engine lathe forms. We put in a mandrel having two centers, and whatever is fastened to the mandrel is turned off true, so as to be concentric to the center.

87 Q. 59. Now, what part of the rolls or fixtures to the rolls did these centers apply to?

A. The centers applied to the roll itself.

Q. 60. Was there any shaft in those rolls, or any arbor, or anything of that kind?

A. No, sir; nothing of that kind.

Q. 61. What supports those rolls now?

A. When they are in operation at the mint?

Q. 62. Yes, sir.

A. They are run in bearings.

Q. 63. What is there in the rolls that runs in bearings?

A. The journals of the rolls run in the bearings.

Q. 64. What kind of journals were there to those rolls?

A. You mean the size?

Q. 65. Oh, give a general description.

A. I think the diameters of those journals was somewhere about five inches or five and a half.

Q. 66. What were those journals made of?

A. They were made of cast iron, the same as what the roll was.

Q. 67. Were they cast solid with the rolls?

A. They were cast solid with the rolls.

Q. 68. What was the length of each one of those journals?

A. Somewheres about eight inches, I think, and then the roll was longer.

Q. 69. What was the diameter, as near as you can fix it at this time?

A. Of the journals?

Q. 70. Yes, sir.

A. I think somewhere about five inches or five and a half.

Q. 71. Now, when those journals were centered, that you
88 have spoken of, in the grinding machine, what was it that was ground out first?

A. The journals was ground first.

Q. 72. The outside of the journals?

A. The outside of the journals.

Q. 73. Then what was next done?

A. The next that was ground was the outside of the roll.

Q. 74. How did you place the rolls in order to grind the outside of them?

A. After the journals of the rolls were ground, they were placed in bearings in pillar blocks that were made *a* purpose for them, with gibs in the bearings; that was so as to adjust those bearings to different-sized journals. A journal might be an eighth of an inch larger and an eighth of an inch smaller, and it was so as to make them adjustable for different sizes.

Q. 75. And that is what the gibs were for?

A. Yes, sir.; then they were adjusted so as to bring the roll the right height to the center, and the caps to the bearings put over, and then the center part of the roll was ground off so as to be true with the journals.

Q. 76. How wide was the center part of the roll which was ground off?

A. I think it is about eight inches.

Q. 77. Was that on the face of the roll, the outside circumference?

A. That is on the outside circumference.

Q. 78. What was the width of the entire face of the circumference of the roll?

89 A. The center part of the roll?

Q. 79. The entire face; the entire width of the face.

A. The entire length of the roll?

Q. 80. Yes, sir.

A. That would be somewheres from twenty-four inches to three feet long. Each roll, besides the length of the journals, has a portion of the roll so they can put on a driving pulley.

Q. 81. Please state whether or not that grinding of the surface of the roll made that portion of it exactly concentric with the center of its axis or not.

(Question objected to by complainant- as leading.)

A. It did. That was the object of grinding it.

Q. 82. I will read you the description from the patent, "Exhibit B," in this case, as follows: "My improved pulley belongs to

class of pulleys composed of a separate spider, usually of cast metal, and a wrought-metal rim, which is secured to the spider; and my invention consists in a pulley which is perfectly true and accurately balanced—that is, a pulley in which the center of gravity and geometrical center or axis coincide. The belt pulleys of various kinds in use prior to the date of my invention have all been more or less open to the objection of not being accurately balanced. This defect has been inherent in their structure. Thus, while past pulleys are of accurate shape, they cannot be practically produced of perfect balance, owing to the irregularity of the weight of the metal at different portions of the rim and to contraction in cooling; and where pulleys of similar character to that herein shown have
90 been made, the spiders have not been properly prepared—that is, the spiders have not been operated upon so as to make the ends of their arms exactly concentric with the true center or axis of the pulley. The arms of the spider, owing to the impracticability of making perfectly accurate and smooth castings and to contraction in cooling, will necessarily possess slight irregularities relatively to the center of the pulley, and unless these are removed and the ends of all the arms made exactly concentric with the pulley axis the completed pulley will of necessity be imperfectly balanced. Substantially the same is true of composite pulleys of any character—that is to say, the spider, however made, will be slightly imperfect in shape, and unless the irregularities are cured before applying the rim, the completed pulley will not be accurately balanced." I have read that portion of the specification between folios 5 and 45. Do you, as a practical mechanic, understand what the irregularities are that are there spoken of in ordinary cast pulleys?

A. Oh, yes.

Q. 83. Please look at the drawing of the patent, "Exhibit B," and state whether or not you understand the lugs which are shown in the drawing on the ends of the arms.

A. Yes, sir.

Q. 84. Now suppose that that was a cast spider with arms, and transverse lugs on the ends thereof, as shown in that drawing, please state whether in practice those arms would be of unequal
91 lengths to a greater or less degree when the casting was cool.

(Question objected to by complainant- as leading.)

A. Yes, sir; they would be unequal in length and unequal in weight.

Q. 85. What would make them unequal in weight?

A. The expansion or the manner of ramming the casting or the mold. If it is not rammed exactly even all through, the casting will swell and there will be more iron in the soft places than there would be if it was a little hard; also that same effect takes place in the cooling of the casting, in the shrinkage, so that there is an unequal length, and there is also an unequal size.

Q. 86. In what part of the arms will the inequality in size occur, in practice?

A. In the straight part and the part from the hub to the rim on the outside. It takes place wherever the variation in the ramming of the mold takes place.

Q. 87. Now, would grinding off the ends of those arms concentric with its axis have any effect whatever in making the arms of equal weight as to the other portions of the arms other than the ends of the lugs?

A. No, sir; it would not affect the lugs at all. It would only leave the ends of the lugs concentric with the center.

Q. 88. Now, in cases where one of the arms was slightly longer than the other, state whether or not it would be necessary to grind off more metal from one of the arms than from others in order to make them concentric.

A. It would.

92 Q. 89. In grinding away that additional amount of metal, would it also take away that amount of weight?

A. It would.

Q. 90. Now, in the grinding which is spoken of in this patent, "Exhibit B"—that is, the grinding off of the ends of the arms in practice—would that equalize the weight of the different parts of the pulley so as to make a balanced pulley or not?

(Question objected to by complainant- as leading.)

A. It would not affect the balancing part of it at all. The spider would be out of balance.

Q. 91. What other pulleys with wrought-iron metal rims, if any, had you made or assisted in making prior to 1880?

A. Well, we made wrought-iron pulleys with gas-pipe arms.

Q. 92. When was that?

A. I think it was about 1864 or 1866; somewheres along there.

Mr. ECCLES: That question and answer *is* objected to because the pulleys are not produced or accounted for.

The WITNESS: It was for some mill-work that was being made at the Vulcan iron works at that time to go to Mexico, and these pulleys were made so as to take apart and pack. The pulleys were, I think, five feet in diameter and about eight-inch face. The center was cast iron, and they were drilled and tapped where the gas-pipe arms screwed into them, and then there was a lug piece that would form the same as an outside bracket, which screwed on the outside of the arm, and then the rim was rolled up and fitted to the

93 lug pieces, and after they were put together they were taken apart and packed up and shipped in pieces. I think the rim was in three or four pieces; I am not sure which.

Q. 93. How many of those pulleys were made at that time?

A. I think there were six made at that time, and then there was another lot made at another time.

(Objected to on the grounds last above specified.)

Q. 94. State whether or not the ends of the arms of those pulleys were made concentric with the axis of the pulleys.

A. They were.

Q. 95. Please state how they were so made concentric—by what operation.

A. The center was bored out first, and then holes were drilled in the center to receive the gas-pipe arms. Then the outside lug pieces were screwed on, and then they were put onto a mandrel and a gauge put up, and the lugs were dressed off by hand, and these arms were marked to a certain place on the hub, and then the lug was marked to a certain place on the arm, so that in putting these pulleys together again they would go right up to this mark, so there would be no difference in the length of the different arms.

(By Mr. ECCLES:)

Q. 96. They were filed off by hand?

A. Yes, sir; just dressed up. There wasn't but very little to take off, because we gauged them with a screw where they were screwed into the hubs.

(Mr. WHEATON:)

Q. 97. What became of those pulleys that were made by you in 1863 or 1864—the last lot that you mentioned?

94 A. They were shipped to Mexico. I couldn't tell what part now.

Q. 98. What became of the first lot of pulleys that you have described, that were made in 1854 by the Vulcan foundry?

A. I couldn't tell exactly where those went to, but I have an idea it was for a saw-mill—saw-mill shafting—that those were for. We were building a good deal of saw-mill machinery at that time, and I couldn't tell you what part of the country they went to.

Q. 99. Can you tell me whether or not all those pulleys you have described were good, merchantable pulleys, and good for practical use?

A. They were.

Cross-examination of WILLIAM H. BIRCH.

(By Mr. ECCLES:)

Q. 1. Why didn't you, in this last lot of pulleys, turn them off in a lathe—the spiders, I mean, or lugs—after the arms were put in the boss or center?

A. It would have been a longer job turning them off with a lathe than to dress them by hand, because we could adjust them by the screw threads.

Q. 2. Now, as I understand you, these rolls for the mint were simply centered as you would an ordinary piece of iron that you were going to turn in a lathe, and then the journal was ground off concentric with that center?

A. Yes, sir.

Q. 3. And then you put them in a frame, did you?

95 A. Put them in bearings.

Q. 4. Well, were those bearings in a frame?

A. Those bearings were fitted to slide on the top of the grinding frame.

Q. 5. Those bearings slid on a slide? A tongue slide, or what?

A. On a slide the same as a lathe slide.

Q. 6. So that you could shove the roll up to the grinder; was that it?

A. We brought the stone against the roll.

Q. 7. So you would shove the stone against the roll?

A. Yes, sir.

Q. 8. Which slid, the stone or the roll?

A. They both slid. The frame was a longitudinal one, and that carried these bearings on that holds the roll, and that has guide pieces—plain V's—so that these bearings can be shoved towards each other.

Q. 9. Shoved endwise?

A. Yes, sir. At right angles to this frame is another frame, and on that frame is a grindstone, with its mandrel and pulley and everything complete, and there is a screw that is attached to the last frame mentioned, which is regulated by a wheel, and on the end of that screw is a hand wheel that comes to the end of the longitudinal frame, by means of which you draw the grindstone up to the roll or move it back.

(By Mr. WHEATON:)

Q. 10. Which way did the roll itself turn?

A. The roll turned against the stone.

Q. 11. Well, which way was the axis of the roll? Was it the same way as the axis of the stone?

96 A. Yes, sir; it was parallel with the axis of the grindstone.

Q. 12. So that the face of the grindstone and the face of the roll came together?

A. Yes, sir.

Q. 14. Where is that grinding machine now?

A. It is up here in the Mint building. They grind all the rolls in it.

(By Mr. ECCLES:)

Q 15. You regulated the turning of the roll by hand, did you, in the process of grinding?

A. No, sir; turned the roll by a belt.

Q. 16. Turn in the same direction of the grindstone, or in the opposite direction?

A. In the opposite direction, against the stone.

Q. 17. That roll was a solid piece of iron, wasn't it?

A. Yes, sir.

Q. 18. Throughout, clear to the center?

A. Yes, sir.

Q. 19. And from end to end?

A. Yes, sir; solid.

Q. 20. Why did you grind it in preference to turning it?

A. Because it was cast in a chill.

Q. 21. Because it was hard and cast in a chill?

A. Yes, sir.

Q. 22. And you couldn't turn it?

A. Well, we could turn it, but we couldn't turn it so accurate as we could grind it, and we couldn't turn it so quick as we could grind it.

Q. 23. Wasn't it hard enough to chip if you turned it?

A. Yes, sir; you could chip it; you could break it off.

97 Q. 24. That would be unfit for a roll then, wouldn't it, if you had turned it?

A. Yes; you can chip white iron.

Q. 25. I am not asking you what you could chip, but I am asking you why you ground that in preference to turning it.

A. Well, I say that I ground it because we could grind it better, truer, and quicker.

Q. 26. Didn't you grind it because it was absolutely impracticable to turn it?

A. No, sir; because we have turned them.

Q. 27. Without chipping them?

A. I don't understand what you mean by chipping.

Q. 28. Well, I mean by "chipping"—when a tool runs into a hard piece of iron it is liable to cut in deeper than a tool naturally would in soft iron.

A. It is just the opposite to that.

Q. 29. Well, chip out?

A. Yes; chip out. If the iron is harder than the tool it presses the tool away or breaks the edge off.

Q. 30. And that would turn it uneven?

A. Yes, sir; it would in that case, if the iron was harder than the tool.

Q. 31. Suppose any portion should be softer than the tool?

A. Then it would turn.

Q. 32. Then the consequence would be that the hard portions would be further from the center and the soft portions would be closer to the center if you turned with a tool; is that so?

A. Well, that takes place to a very slight extent. In a

98 casting that is made in a chill, that chill runs a certain thickness around from the periphery of the casting.

Q. 33. Well, I am asking you about the manufacture of these rolls.

A. Well, you mean to ask about the way these castings are made and how they come out. I cannot imagine anything directly opposite from what my knowledge is. I can't imagine a thing chilled in one portion of it and not in another portion of it.

Q. 34. You can imagine a roller of cast iron cast in a chill that is harder in one portion of its periphery than it is in others, can't you?

A. Not without you have cut through the chill. If you have cut through the chill, then that may take place. You might cut through the chill on one side and not cut through it on the other side.

Q. 35. The nearer you get through the chill the sifter it becomes?

A. Yes, sir; the nearer you come to the center.

Q. 37. Now, if you take a piece of chilled iron the size that you claim these rolls were and you put it on a mandrel or in a chuck and attempt to turn it on its periphery with a tool, would that tool strike in turning any portion of that chilled part that would be softer than other portions, or would it not?

A. It might, if you turned through the chill—through the depth of the chill.

Q. 38. Well, you know it would if it turned through the
99 depth of the chill. There is no "might" about that, is there?

A. Well, after you had turned through the chill, of course it would be softer, but that chill might be a little deeper on one side than the other. It might be five-eighths of an inch on one side and half an inch on the other, and then, of course, you would have a soft chill on one side and hard on the other.

Q. 39. Now, is it not a fact that those very pieces of iron which you have ground up and all pieces of iron of that heft that are cast in a chill—isn't it a fact that the chilled surface is deeper in some portions than it is in others?

A. Yes, sir; to a certain extent; not a very great deal.

Q. 40. And it is also the fact that the chill becomes less hard as you approach the center?

A. Yes, sir.

Q. 41. And if you attempt to turn it with a tool the tool will pass through softer portions at one part of the periphery of the roll than it does at another?

A. Well, it does if you are getting through the chill into the softer center. If the tool is on the chill there is no difference. It is hard all alike. I have turned up a good many chilled rolls and I never found any difference—never at all—until you get nearly through the chill on one side.

Q. 42. Now, take a roll that has a chill of half an inch on one side and a quarter of an inch on the other?

A. Well, I have never seen it vary that much.

Q. 43. Well, how much?

A. An eighth of an inch.

100 Q. 44. Well, take one that varies half an inch. You center it and put a tool on it, and do you mean to say that you have found a chilled piece of cast iron that that tool in passing around the periphery of the iron in the lathe will not find softer portions in some places than it does in other places?

A. Yes, sir.

Q. 45. Did you ever turn a piece of chilled iron in your lathe?

A. Yes, sir; I have turned a great many.

Q. 46. For what purpose?

A. For rolling gold and silver.

Q. 47. Why didn't you turn these for the mint instead of grinding them?

A. Because we had this machine brought out from the East on

purpose to grind them without turning. Before we got this machine we used to turn them, and after we had them turned we would take and grind the surface of the roller part with a lead wheel and emery.

Q. 48. Then your actual experience is that the turning wouldn't do alone?

A. The turning of the roll don't bring it down to a dead surface.

Q. 49. That is, it don't bring it down to as even a surface as the grinding?

A. As smooth a surface. On this grinding machine, after we had ground the roll up, we used to finish the center part with a lead wheel and emery, so as to bring that surface to a very dead surface, very close, so we didn't get any grain, any marks, and when the emery wheels were introduced in place of using the lead
101 wheel and the emery we adopted the emery wheel. Before we had either the emery wheel or the grindstone we used the lead wheel and the emery.

Q. 50. Where were those cast-iron spiders cast that you first made pulleys of?

A. They were cast at the Vulcan iron foundry in this city.

Q. 51. Did you see them come from there?

A. Yes, sir.

Q. 52. You hold those arms at the end in a chuck, don't you, in turning?

A. No, sir.

Q. 53. How do you hold them?

A. Bolted on a face plate.

Q. 54. Each arm was bolted on a face plate?

A. Well, the spider was bolted right up against the side of the face plate.

Q. 55. Did the arms press against the face plate?

A. The arms bear onto wood blocks. I- was generally the custom to put wooden blocks behind each arm.

Q. 56. What were those wood blocks put behind the arms for?

A. So as to make a kind of an elastic hold. If it was bolted up rigid against the face plate, there was a chance of cracking these arms, but if you bolt them up against some soft surface you hold them just as rigid, and at the same time you have an elastic bearing behind.

Q. 57. Did you ever grind any cast-iron spider arms concentric with the center?

A. No, sir; I never ground any.

Q. 58. Were not those pieces of wood or chuck pieces put behind the arms also in order to prevent the jerking and consequent
102 chipping of the lugs by the tool?

A. No, sir; it had nothing to do with that.

Q. 59. It hadn't?

A. No, sir.

Q. 60. Have you read and carefully studied the specification of the patent, "Complainants' Exhibit B"?

A. I read it over and also heard it read by Mr. Wheaton here. I understand the whole gist of it.

Q. 61. You say that the arms there will be of different lengths when that spider is cast in that patent?

A. Yes, sir; it will be impossible to get them all the same length in any ordinary casting or any ordinary mode of casting.

Q. 62. Will you look at "Complainants' Exhibit Respondent Pulley" and tell me whether those arms of the spider are ground off or turned off?

A. It looks to me as though they were turned off. I should say they had been turned off.

Q. 63. Can you see any tool marks on it?

A. I can see marks on it that would probably be left by a tool and that looked to me as though they were turning marks.

Q. 64. Then you think those were turned off?

A. That is my opinion, that it has been turned off.

Q. 65. If they should have bee- ground off instead of turned off, what would you then think of your opinion as an expert on grinding?

A. I should think I was mistaken; that is all.

Q. 66. You are perfectly familiar now with this patent,
103 "Complainants' Exhibit B," having read it over carefully?

A. Yes, sir.

Q. 67. And know how a pulley is made after that patent?

A. Yes, sir.

Q. 68. You are also perfectly familiar with the patent, "Complainants' Exhibit C," which you have testified to; you have read that over?

A. Yes, sir; I am familiar with it in a general way. Of course, I couldn't repeat the specification.

Q. 69. Now, will you tell me how a pulley is made, in accordance with the patent, "Complainants' Exhibit B," without looking at the specification?

A. The spider would be bored out first, I should judge, or else put in some kind of a clamp to hold the hub, and then it would be ground on those lugs, on the outside of the lugs, so as to be a true concentric, and then from there it would go into a former, that would be set true by the outside, and a hole bored so as to make the hole central with the outside of the rim.

Q. 70. It would not be ground first and then the hole be bored afterwards?

A. Well, it could be made either way.

Q. 71. I am not asking you how it could be made. I am asking you which way it is made by these specifications.

A. Well, I couldn't tell you whether they bored the hole first or ground the outside first, but of course I know which would be the best way to make it. If I was making it I would bore the hole first.

Q. 72. Can you tell from the specification of the patent,
104 "Complainants' Exhibit C," how a pulley rim would be made by that specification?

A. The rim would be rolled. That is the only way it can be made.

Q. 73. Rolled how?

A. Rolled by passing it through rollers.

Q. 74. Well, go on and tell us just how you would make it.

A. Roll it to its proper diameter and also to the proper shape, whether it would be round or flat faced.

Q. 75. Can you tell us from that specification just how you would commence to make a pulley and how you would go on and how you would end—I mean by that specification?

A. Not by the specification. I know how I would make it.

Q. 76. Do you know anything about how the Risdon Iron and Locomotive Works, the defendants in this case, make their pulleys?

A. No, sir; I never saw them make them. I know they must roll up the rim and I know they cast those wrought-iron arms in the center, but I don't know whether they grind off those center pieces or turn them; but I should judge, by looking at the end of one of the arms that is exposed in "Exhibit Respondents' Pulley," that it was turned. With the rim, of course there is no question about that; that must be rolled, so as to make it the proper diameter and the proper shape.

Q. 77. That is, the rim of this pulley, "Exhibit Respondents' Pulley," the crown is put in at the same time that the circle is formed on the rim?

A. Yes, sir.

105 Q. 78. By one and the same operation?

A. Yes, sir.

Q. 79. And by one and the same rolls?

A. Yes, sir.

Q. 80. A different set of rolls, however, than the rolls which you use to roll the rims on of your first set of pulleys that you made?

A. The rolls that we used for those were ordinary rolls for rolling boiler iron—just straight rolls—and the only way of giving the rim a curvature was pressure by a narrow strip of iron on the outside.

Q. 81. Where was that piece of iron, on the inside of the rim of the pulley or on the outside?

A. On the inside.

Q. 82. How large a strip of iron was that?

A. Well, I couldn't tell you exactly. It was somewhere about three or four inches wide. I think on a twelve-inch width face it was somewheres about that, and I should judge it was an eighth of an inch thick. I didn't roll them myself, but I saw them rolled.

Q. 83. You didn't roll them?

A. No, sir; I didn't roll them.

Q. 84. Did you superintend the rolling of them?

A. No, sir; I didn't superintend them, but I saw them rolled up.

Q. 85. Did the strip of iron roll in a circle like the rim?

A. It followed the curvature of the rim to a certain extent?

Q. 86. Well, to what extent?

A. You mean that the piece which was put in the center followed the curvature or the rim?

106 Q. 87. Yes, sir.

A. Well, I don't know that that part followed any curvature at all; it was the curvature of the plate outside.

Q. 88. Then the convex and concave surface of that rim was made before it was left in a circle?

A. No, sir; the rim was flat when it was put in the rolls. It was not bent until by the action of the rolls and the pressure being put on the plate with this iron in the center.

Q. 89. Then you took a straight piece of iron and put a rim of iron into the rolls with that straight piece of iron, did you?

A. Yes, sir.

Q. 90. And run it through these rolls?

A. Yes, sir.

Q. 91. And that gave a convex and concave surface to that rim?

A. Yes, sir.

Q. 92. Now, that threw the outside down and the center up?

A. It threw the outside down.

Q. 92½. And then you put it in the rolls and turned it in a circle?

A. We didn't turn it at all.

Q. 93. Well, you bent it into a circle?

A. Well, we rolled it all at one time. The pressure of the roll was sufficient to throw the outside edges down and at the same time roll it to its proper diameter.

Q. 94. Roll it to a circle?

A. Yes, sir.

Q. 95. Then all the crown that there was to that rim was just simply that crown which was made on a straight roll by the pressure of the piece of iron in the center and no pressure at the edges?

A. Yes, sir.

107 Q. 96. That is all there was to it?

A. Yes, sir; that is all there was to it; that is all we wanted.

Q. 97. How wide was the surface of those pulleys?

A. I think it is about twelve inches. I think they run from eight inches up to twelve or sixteen.

Q. 98. Did you ever measure one of those pulleys to see how much crown there was in the rim?

A. No, sir.

Q. 99. Now, these rolls are perfectly straight ordinary boiler-iron rolls, I understand?

A. Yes, sir.

Q. 100. And all that you made the crown of the rim with was the pressure of this piece of iron in the center and no pressure on the edges?

A. Yes, sir; the pressure on the center.

(By Mr. WHEATON:)

Q. 101. With that roll cold?

A. Yes, sir.

(By Mr. ECCLES:)

Q. 102. Please look at this draft that I show you and see if that correctly expresses a sectional view of these rolls, iron, and rim of the pulley as it is being rolled.

A. That is the principle; only you have got the center piece too wide in proportion to the rim.

Q. 103. Just mark on that draft the number of inches that the iron was and the number of inches that the rim was.

A. Well, I couldn't tell you. It is only from memory that I am telling; but I have an idea it was three or four inches wide on a twelve-inch plate. I am not sure about that.

108 (The draft last above referred to is introduced in evidence by complainant- and marked "Complainants' Exhibit Birch Draft.")

(A recess was here taken, in conformity with agreement of counsel, until half past one o'clock this afternoon.)

SATURDAY, *August 3rd*, 1889—afternoon.

Present: Mr. Eccles, of counsel for complainant-; Mr. Wheaton, of counsel for respondents.

Cross-examination of WILLIAM H. BIRCH (continued).

(By Mr. ECCLES:)

Q. 104. What kind of a turning machine was used in turning up the arms of those first pulleys that you made?

A. It was a lathe; an engine lathe.

Q. 105. An ordinary engine lathe?

A. An ordinary engine lathe? I don't know as I ever saw one like it before.

Q. 106. Did you say that you didn't know whether you had ever seen one like it before?

A. No, sir; I never did; you see the manner of the gearing in these large lathes are all a little different.

Q. 107. They are made d-fferent now?

109 A. Yes, sir; and they were made different then in the arrangement of the gears from the cones and to the face plate. Of course, the principle is the same on all of those engine lathes, but the elements of gearing is a little different.

Q. 108. What did you say the diameter of those first pulleys was?

A. I think they were somewheres about five feet—from five to six feet. I know they were over four feet because they had cast-iron patterns for four-foot pulleys, but they had none larger than that, and these were larger than the patterns we had, and that is the reason they made these that way, because they had no patterns of that size.

Q. 109. You didn't turn them up yourself?

A. No, sir; I didn't turn them up. I think, as near as I can remember, that the man that turned them up was named Tolbert. Of course, I couldn't state positively that he was the man.

Q. 110. You didn't superintend the turning of those pulleys?

A. No, sir; I was not foreman of the shop; I was a workman in the shop.

Q. 111. Did you critically examine the turning of those pulleys or just casually examine them?

A. I just casually examined them. I saw them bolted on the face pl-te, and the process of being turned and bolted.

Q. 112. Did you ever read the specifications of the English patent, termed the Robert Mathers patent, referred to in your examination-in-chief?

A. No, sir; I never read it.

110 Q. 113. You testified in your examination-in-chief that a rim constructed by the specification of that patent was crowned and bent into a circle at one and the same time, or substantially that, didn't you?

A. Yes, sir; I did.

Q. 114. How do you know that is the fact?

A. Mr. Wheaton read the specification to me and I understood it from the way he read it.

Q. 115. Did you ever read this specification or examine it, except what Mr. Wheaton read to you?

A. No, sir; I never read that English patent at all.

Q. 116. Do you know whether in that patent there is a spider constructed similar to the one in "Complainants' Exhibit B" or not?

A. No; I couldn't tell.

Q. 117. Do you know how the spider is constructed in that patent?

A. No; I do not. The part that I referred to in that answer was the rim, the manner of rolling and crowning at the same time.

Q. 118. You are sure that is the way it is done in that patent?

A. That is the way I understood from Mr. Wheaton's reading of that portion of the patent.

Q. 119. Now, let me read you a portion of that patent and see then how you understand it; I refer to the Mathers patent: "This driving surface or rim constitutes a separate band or strip of sheet iron or steel of a suitable thickness and of any breadth required, and is bent into form by passing it repeatedly through and

111 between a pair of bending rolls of hard or chilled metal for the purpose of bringing it to the diameter required." "For the purpose of bringing it to the diameter required"—is there anything in that which says it is crowned in that operation?

A. Nothing in that.

Q. 120. Now, there is a period. Now, commencing another sentence: "The driving rims thus formed." That means formed in a circle, does it not?

A. Yes, sir.

Q. 121. "The driving rims thus formed may be made flat or convex in cross-section by means of suitable rolls." Now, that means that after it is formed into a circle it may then be formed convex by suitable rolls, does it not?

A. I do not so understand it.

Q. 122. Can you tell me what is meant by "the driving rims thus formed"?

A. It can be formed flat or rolled, as they choose.

Q. 123. That is what you understand by that?

A. Yes, sir.

Q. 124. Then "the driving rims thus formed" does not refer to the rims rolled into a circle?

A. It does. It is done at one operation. I know that nobody would be so foolish as to go and roll them flat.

Q. 125. Well, I want you to tell me how it is made by that patent.

A. Well, that is how it is made by that patent.

Q. 126. Now, it says here, as I said before, "and is bent into form by passing it repeatedly through and between a pair of bending rolls of hard or chilled metal for the purpose of bringing it to the diameter required." Now, what does that mean? It means,
112 does it not, that that rim is first rolled into a diameter form, does it not?

A. I don't take it that way.

Q. 127. Well, what does the language say?

A. Well, I take it that it would be rolled in a perfect diameter form and flat or curved, as they wished to make it.

Q. 128. You think that language means that, then, do you, that I have read to you?

A. Well, I couldn't say whether it means that or not, but that is the way I should take it, as a mechanic. I should say that no man would be foolish enough to roll a thing twice when he could do it by rolling it once.

Q. 129. And that is your reason, that a mechanic would not be foolish enough to roll a thing twice when he could do it by rolling it once, for saying that that patent made it by doing it at one and the same time?

A. Yes, sir.

Q. 130. And that is all there is about it?

A. By your reading of those specifications I should take it that one set of rolls would be sufficient, and that is all that would be required.

Q. 131. That is the way you think it was meant to be done by the patent?

A. Yes, sir.

Q. 132. Now, I will read this again, and I want you to listen to it and see the import of the question and answer it: "The driving surface or rim constitutes a separate band or strip of sheet iron or steel of a suitable thickness and of any breadth required, and is bent into form by passing it repeatedly through and between
113 a pair of bending rolls of hard or chilled metal for the purpose of bringing it to the diameter required." Now, is there anything in that that tells you that that rim is to be crowned?

A. Yes, sir.

Q. 132. Well, what is it?

A. Well it says to be rolled in proper form, or form; they use the words "form" and "diameter."

Q. 133. Then you think because it uses the word "form," and also uses the words "bringing it to the diameter required," that therefore it means crowning it and bringing it into a circle?

A. Crown it or bring it to a flat surface, either.

Q. 134. Can you tell me what kind of rolls are used there, if you think that is the meaning there, to ben- that into a conical shape and diameter at the same time?

A. They would be curved rolls.

Q. 136. Well, how do you know?

A. Well, my idea of that is this: If they are rolling up rims to be a crow-ing face, they will use a roll that is concave and convex, but if they want rims to be a flat face, they will be rolled in a flat roll.

Q. 137. Why didn't you use those kind of rolls when you were rolling your rims for your pulleys?

A. Well, we rolled them with the rolls that we had. We didn't make special tools for doing it.

Q. 138. Did you ever see a rim for a pulley that was crowned and bent into a circle at one and the same time by a system of rolls before you saw it done here in this city by either the Risdon
114 iron and locomotive works or by the licensees of Mr. Medart?

A. I have never seen either the Risdon iron and locomotive works roll their rims, nor I have never seen the licensees of Mr. Medart roll theirs.

Q. 139. Then you never saw a rim crowned and rolled into a circle at one and the same time by anybody except the ones that you speak of yourself?

A. That is all.

Q. 140. Now, will you tell me what is meant by these words in this specification of this patent, the Mathers patent, in the following words: "The driving rims thus formed." What is meant by "The driving rims thus formed?"

A. That is the driving rims that are rolled up either flat or crowning.

Q. 141. "The driving rims thus formed" in that specification means rims that are turned into a circle either flat or crowned, does it?

A. Yes, sir.

Q. 142. You are sure of that?

A. Yes, sir; that is the way I understand it.

Q. 143. That is the way you understand this specification?

A. Yes, sir.

Q. 144. Now, the following words are "may be made flat or convex in cross-section by means of suitable rolls." What is meant by that?

A. That is the same as I said before; if they go to use a crowning face they have concave and convex rolls, and if they go to use a flat face they use the flat rolls.

Q. 145. Didn't you just say that the words "The driving
115 rims thus formed" meant driving rims with a crowned surface or flat surface?

A. Yes, sir.

Q. 146. And bent into a circle?

A. Bent into a proper diameter.

Q. 147. Then, if those words mean that, in that specification, what is the use of adding the words "may be made flat or convex in cross-section by means of suitable rolls"?

A. All that means is that it takes a convex and concave rolls to roll a curved face, and flat rolls for rolling the flat faces.

Q. 148. But what is the use in saying that the driving rims thus formed may be made so and so, if they are already made so and so?

A. Well, I am not correcting their English there, or their grammar, or anything of the kind. I take what I should judge to be the meaning of what they say by their words, and I should take it on that part where they say "form" and "diameter" to be whatever form they choose to make, either a rounding face or a flat face.

Q. 149. Did you ever have any conversation with Mr. Wheaton or anybody else about the meaning of this patent, this Mathers patent?

A. No, sir.

Q. 150. And you don't know whether this spider has a second rim around it or not?

A. No; I don't know anything about the details; all I heard, I heard Mr. Wheaton read that part. He called my attention to that part that he read in regard to the formation of the rim, and to the specifications in one of those other patents, and asked me
116 if there was any difference, and I told — no, there was no difference, any more than the difference in the language, of course—the way it is expressed there. I should take it that the intention and explanation was the same.

Q. 151. Do you know what the difference is or will you explain the difference between the center of gravity of a pulley and its geometrical center?

A. The center of gravity is that portion of the center where the pulley will remain stationary, and its geometrical center is the center that would be formed by revolving or oscillation.

Q. 152. Will you tell me how you go about it to get the geometrical center and the center of gravity in a pulley?

A. To get the center of gravity in a pulley we put it on two straight edges; have two parallel straight edges that are level, and put the pulley onto a mandrel and let the center of gravity come to the bottom—that is, it will roll over until the heavy part comes to the bottom, and the pulley will remain stationary, and we know that is the heavy part, and the center of gravity is where it stops.

Q. 153. That is after the pulley is bored, then?

A. Yes, sir; after the pulley is bored.

Q. 154. Well, now, how do you get the geometrical center?

A. You get the geometrical center by having it revolve on a shaft and the shaft remain stationary at one place.

Q. 155. Then you cannot get the center of gravity until you bore the pulley?

A. Oh, you can get it without boring the pulley.

117 Q. 156. Well, is that all the explanation of the difference between the finding of the center of gravity of a pulley and the geometrical center which you care to give?

A. Well, that is all I think of just at present.

Q. 157. Is that the way it is found by this patent, "Complainants' Exhibit B"?

A. I couldn't say, because I haven't studied that patent close enough to know.

Q. 158. Then there are some things in that specification that you don't know anything about?

A. I know the general tenor of the specification, but I don't know the exact wording of it. I have made no study of those specifications. What I have seen of them is what Mr. Wheaton has read to me. I have just looked at it cursorily this morning. I have made no study of it at all.

Q. 159. Then you don't know whether it makes any difference or whether there is any stress laid on making the center of gravity of a pulley coincide with its geometrical center in that patent or not?

A. All I know of that patent is that it describes some mode of manufacture. That mode is supposed to be a mechanical mode, and to state whether that mode is a perfect mode or not I would have to study the patent up to see.

Q. 160. Will you explain in your own language just what that mode of manufacture is in that patent?

A. I could not, from the specification. I know there is two ways it can be manufactured—that is, by boring the center first

118 and grinding off the arms second, or the spider can be put onto chucks to hold the spider, and the arms can be ground first, and then the hole is bored in the center afterwards, sitting by the outside of the arm. Now, either way it can be manufactured.

Q. 161. I am not asking you how a pulley can be manufactured, but I am asking you how it is manufactured by that specification of the patent, "Complainants' Exhibit B."

A. Well, I am telling you that I don't know whether it is manufactured with the hole bored first or bored second.

Q. 162. And you don't know as it makes any difference?

A. If I was manufacturing it, I should bore the hole first.

Q. 163. Why?

A. Because then I have a fixed point to start from and I don't have to set; I have only one setting to the spider. In the other way you have two settings to the spider.

Q. 164. Did you ever manufacture or assist in manufacturing composite pulleys—and by composite pulleys I mean pulleys that have their rims separate before being put together from the spider or

center portion—before or since those spoken of in your examination-in-chief?

A. No; those are the only ones that I know of.

Q. 165. You said in your examination-in-chief, or words to that effect, that there is no difference in the rolls used in the English patent known as the Mathers patent and the rolls used to form the rim in the patent "Complainants' Exhibit B." How do you know?

119 Mr. WHEATON: That is objected to on the ground that the witness did not so testify. His testimony was that there was not any difference shown in the two descriptions referred to between the rolls used in the one case or in the other.

A. I know that the rolls have to be made in such a way as to do the work. There may be a little difference in the mechanical construction, but the rolls themselves must be alike or somewheres near alike. There can be more gears or no gears or larger shafts or more rolls or less rolls, but they must be flat for flat surfaces and they must be convex and concave for round surfaces.

Q. 166. And they must be so arranged as to make a crown on the rim and curve it at one and the same time?

A. Yes, sir; they will do that anyway; they cannot help but do that.

Q. 167. But they must be so arranged?

A. Yes, sir.

Q. 168. And could not be arranged in any other way?

A. They could not unless a man wants to do the work over twice.

Q. 169. Well, suppose he wanted to do it over twice?

A. Oh, then he could pass it through a dozen rolls if he wanted to.

Q. 170. Then it could be formed into a circle by flat rolls and rolled into a crown by round rolls?

A. Yes, sir; but people don't do that kind of business. When they can roll up a thing by one operation they won't take two operations to do it.

Q. 171. And you don't know in the Mathers patent but
120 what they rolled it into a circle first by straight rolls, and then crowned it by another set of rolls, do you?

A. No, sir; I s-ould not say they did, from the description.

Q. 172. Well, I say that you don't know but that they did?

A. I never was there to see Mr. Mathers' rolls, but I know that anybody would use a common-sense way to make such things.

Q. 173. That is, from your knowledge obtained from subsequent years, isn't it?

A. No, sir; that is the knowledge that anybody would have, knowing what you would want to do.

Q. 174. Then you think that anybody with common sense would naturally roll those rims into a crown and circle it at one and the same time?

A. Yes, sir.

Q. 175. And that is the reason you think the specification of the patent means that?

A. Yes, sir.

Q. 176. And the only reason?

A. Well, I take the language of the specification, also, where it says "form" and "diameter." I take it that that form there is round or flat and the diameter is the size.

Q. 177. And yet you didn't use those shaped rolls to make the ones you made?

A. No, sir; because there was no *specila* rolls made for them.

Q. 178. And you never saw any made for them before?

A. That is, concave and convex rolls?

121 Q. 179. No, sir; the rolls convex and concave, and to roll it into a circle at one and the same time.

A. No, sir; I never did, but common sense would teach me to make rolls.

Q. 180. Never mind about common sense and what it would teach you. You never saw such rolls, did you?

A. Yes, sir; I have seen rolls of all shapes.

Q. 181. Now, my dear sir, will you answer these question-: Did you ever see a set of rolls made concave and convex and so arranged as to bend a piece of iron into a circle, and to convex and concave it at the same time?

A. I don't know as I have on iron, but I have on other materials.

Q. 182. Well, what other materials?

A. Well, on silver.

Q. 183. Where did you ever see them?

A. I have seen them and made them for Vanderslice here in this city.

Q. 184. When first did you see them or make them?

A. I think the first we made for him was somewheres about 1858 or 1860.

Q. 185. For rolling what?

A. For rolling silverware, rolling napkin rings, and such things as that, just according to whatever form they were going to make.

Q. 186. Well, that was after it was formed into a circle that those were used, was it not?

A. No, sir; it was rolled into the form of a circle at the

122 same time. I have seen tinsmiths take a flat punch and roll a rim up on a box before they rolled them up.

Q. 187. Of course, they roll them on a common mandrel?

A. No, sir; they roll them from the shape of the rolls. The shape of the rolls threw the rims up. Rolls are adapted for the different work you want to do. There is no invention in that.

Q. 188. You never saw one to roll out the rim of a pulley before in your life, did you?

A. I never saw them roll the rim of a pulley except those I have spoken of, but common sense would teach me how to do it. I don't consider there would be any invention in making any rolls——

Q. 189. (Interrupting.) Well, never mind that; you are not determining whether there is any invention in this or not.

A. Well, I am just giving my opinion.

Q. 190. Do you know from the description in these patents, Exhibits "B" and "C," whether these spiders are put on a mandrel or whether they are fastened on a chuck or whether they are put on a face plate?

A. You mean the centers?

Q. 191. Yes; the spiders.

A. No, sir; I don't know.

Q. 192. Have you any interest in this Risdon iron and locomotive works?

A. No, sir; none at all

Q. 193. Have you any interest in the defeat of this patent?

A. No, sir.

Q. 194. How came you to testify in this case?

A. I was asked to come here and testify.

Q. 195. By whom?

A. I think it was Mr. Moore.

123 Q. 196. What did Mr. Moore tell you he wanted you to testify about?

A. He asked me if I knew anything about this Medart pulley.

Q. 197. And what did you tell him?

A. I told him that I had seen pulleys made in the same way a great many years ago.

Q. 198. How did you know how the Medart pulley was made?

A. Well, I can see them. I have seen the pulleys and I can tell how they are made.

Q. 198½. You don't know anything about the process of making them, do you?

A. Yes, sir; I do.

Q. 199. Can you tell me what the process is, according to the patents?

A. No, sir; I couldn't tell you according to the specifications.

Q. 200. Can you tell me how they make them, in fact?

A. Well, I might not tell the exact things they pass through, but I can tell you how they are made.

Q. 201. You mean to say that you can tell the result and not the process?

A. I can tell the form that the castings will take and the matter of forming the rim and putting the pulley together, and so forth.

Q. 202. Yes; you can tell from seeing the pulley how you would make it?

A. Yes, sir.

Q. 203. But you cannot tell how they are made, either by the patent or how the licensees make them, or the process that

124 the Risdon iron and locomotive works used to make them?

A. No; I know there is only one proper, cheap way to make them, and if you get away from that your product costs too much money.

Q. 204. How did you find out how to make that pulley?

A. It didn't require any finding out at all. Any mechanic that has got any ideas at all can make the pulleys and put them together.

Q. 205. Go on and tell me in your own language, step by step, how you would make that Medart pulley.

A. I would take the spider first from the casting and would have a tool made that, by putting this spider in it and bringing the jaws up to hold it, it would center, and then I would have a tool come down in a guide and bore it out the proper size, and after that I would take it off of that frame and put it on a machine for the truing of the outside of the spider, either grinding or dressing it, so as to make it true—grinding would probably be the cheapest—and from that it would go to a drilling machine for drilling the holes for the rivets, and if it is to be with a key seat, it would go to a key-seating machine to have a key seat cut, and if it was to have set-screws it would them go to the drill to have the holes drilled for the set-crews, and be tapped; and then the rim, according to the width, would be cut off to the proper width and the proper length for the diameter of the pulley, and then it would go to the rolling machine and be either rolled with a round face or a flat face to the proper diameter, and then it would go to the machine
125 where the spider had been drilled before, and these holes would be drilled in the rim for the rivets, and then the holes would be drilled and countersunk, and then it would be already for the rim to be riveted to the spider; then it would go to the man that did the riveting or the machine that done the riveting and be put together, and after that it would go to the grinding machine for grinding off the outside of the rim, taking off the bunches, and making it true or concentric with the center, and from that machine the pulley would be finished except painting. The painting would be the last operation that the pulley would go through.

Q. 206. And yet you say that you never read these specifications yourself, and that you never saw anybody make one of those Medart pulleys?

A. I do say so. I never read the specifications and I never saw them make the pulleys.

Q. 207. Now, as I understand you, you would put them in and take the center from the outside of the arms; you would put the spider in its holder and you would take the center or center it by taking it from the outside ends of these arms, and then you would bore your center in there?

A. Yes, sir.

Q. 208. And you think that is the way the specifications of the Medart patents describe and manufacture that pulley?

A. No, sir; I don't say so. I say that is the way I would make it—the way I have described. It could be set by the eye——

Q. 209. (Interrupting.) I am not asking you how it could
126 be set, I am asking you about these specifications.

A. I say I don't know about the specifications.

Q. 210. Would that process that you have detailed make a perfectly balanced pulley?

A. Yes, sir; as perfect as it could be; of course it could not be a perfect-balanced pulley, when you come right down to perfection.

Q. 211. It would make as perfectly balanced a pulley as is made in the trade today?

A. Yes, sir.

Q. 212. It would make as perfectly balanced a pulley as the Medart licensees make today, would it?

A. Yes, sir.

Q. 213. Will you state what other matters Mr. Moore told you that he wanted you to testify about?

A. I don't think he stated any other matters.

Q. 214. How lengthy a conversation did you have with him about the construction of this pulley?

A. I think about ten minutes.

Q. 215. Did he tell you how the Medart pulley was made?

A. No, sir; he did not.

Q. 216. Did he show you one of the Medart pulleys?

A. No, sir; I have seen Medart pulleys ever since they were made and have used a good many.

Q. 218. Is the Medart pulley made the same way as the Risdon iron and locomotive works pulley is made?

A. I couldn't tell you about that, because I have never seen the manufacture of either one of them.

Q. 219. Well, you say you know how the Medart pulley is made by looking at it?

127 A. I say the way I should make it.

Q. 220. Then you don't know how it is made by looking at it?

A. I know how I should make it by looking at it, but of course I don't know how they make it.

Q. 221. And you don't know how the Risdon iron and locomotive works pulley is made by looking at it?

A. No.

Q. 222. You know how you would make it, though?

A. Yes; I know how I would make it.

Q. 223. And you would make it the same as you would the Medart pulley?

A. I would make it on the same principle—from the same general idea.

Q. 224. You would use the same process?

A. I would make it by the same process. I would make special tools for different stages of the work.

Q. 224. Well, you would carry it through the same process—you would find the center of the spider and you would grind it off concentrically and you would put on the rim?

A. Yes, sir.

Q. 225. And you would crown the rim and bend it into a circle by one and the same process?

A. Yes, sir.

Q. 226. And at one and the same operation?

A. Yes, sir.

Q. 227. Well, after you made these first pulleys you made no more until you took a contract to make the second set of pulleys, did you?

A. There was no more made until some cause for making some pulleys that way arose.

Q. 228. Well, you didn't make any more until you got a
128 contract to make a second set?

A. I don't know how many there was made. There was a number made at different times during five or six years. I couldn't tell. I think the first time there was four or five or six, and I think afterwards there was two or three, and I think other times there was more made, and so on.

Q. 229. I don't ask you for what you think. Do you know?

A. I know that was the way they were made.

Q. 230. Did they make any of this kind of pulleys or did you see any of those kind of pulleys made after 1864? I believe you have stated, though, and I will withdraw the question.

A. Yes, sir; I don't remember about that.

Q. 231. Will you look at the pulley, "Complainants' Exhibit Respondents' Pulley," and tell me whether, in your opinion, that rim on that pulley could have been made by your rolls which you used in making the rims on those first pulleys you made—if that much crown could have been put on them by that machine?

A. Yes, sir; it could.

Q. 232. With the straight rolls that you used there?

A. Yes, sir.

Q. 233. What is the curvature of that rim? I mean the crown of that rim.

A. It is about one-sixteenth of an inch in width, as near as I can tell. The rim is ten inches and five-sixteenths wide and the crown is a sixteenth of an inch.

Q. 234. One-sixteenth of an inch from the center?

A. Yes, sir.

(By Mr. WHEATON:)

129 Q. 235. That is, the center is one-sixteenth of an inch from each edge?

A. Yes, sir; it is flat for almost six inches at the center.

(By Mr. ECCLES:)

Q. 236. Do you think that was done by such a roll as yours were made by; that the rim in the pulley, "Complainants' Exhibit Respondents' Pulley," was made with the kind of roll that you describe?

A. I couldn't tell that.

Re-examination of WILLIAM H. BIRCH.

(By Mr. WHEATON:)

Q. 1. You were asked some questions on cross-examination as to the Exhibits "B" and "C." Did you answer those questions without looking at those patents?

A. Yes, sir.

Q. 2. Could you understand those specifications in all their details if you were to take them in your hand and look at them and examine them?

A. Yes, sir.

Q. 3. Is a casting of iron which is made in a chill harder than castings which are made in sand?

A. Yes, sir.

Q. 4. About how deep will that higher degree of hardness in a chilled casting extend into a casting?

A. It goes in from a quarter of an inch to three-quarters of an inch in depth.

Q. 5. You spoke of an engine lathe. What kind of a lathe is that?

A. An engine lathe is a lathe which is operated by set
130 tools. The reason we term a lathe an engine lathe is, a hand lathe and an engine lathe is the way to distinguish them. In old times they used to use a chisel in their hand, and in an engine lathe the tools are set in a tool-holder, and are carried by the operation of the lathe to turn off surfaces or bore.

Q. 6. Carry it along automatically as it turns?

A. Yes, sir.

Deposition of E. T. Steen.

Examination-in-chief of E. T. STEEN on behalf of respondents.

(By Mr. WHEATON:)

Q. 1. State your name, age, place of residence, and occupation.

A. My name is E. T. Steen; my age, sixty-two years; I reside in San Francisco, and I am in the machine business; just now I am building machinery a little.

Q. 2. For how many years have you been a practical machinist?

A. I have been carrying on business about forty-four or forty-five years.

Q. 3. As a machinist?

A. Building machinery; yes.

Q. 4. Do you know the pulleys manufactured by Meese & Clot, in this city, known as the Medart pulleys?

A. Yes, sir.

Q. 5. How long have you been acquainted with them and their construction—those particular pulleys, I mean?

A. Oh, I have no data to go by, but I should judge it was six or seven years.

131 Q. 6. You have known them ever since they have commenced making them?

A. Yes, sir.

Q. 7. When did you know of any belt pulleys being manufactured with a wrought-iron rim?

(Question objected to by complainant- as leading.)

A. The first I recollect anything about any was about 1853.

Q. 8. When, if ever, did you ever assist in making any such pulleys?

A. Well, I don't recollect assisting in making any, but I was carrying on business for the Vulcan iron works under the firm of Gordon & Steen, for which I was manager. The first I recollect of making any pulleys of that kind was in 1853 or about 1853.

Q. 9. Please state how they were made.

A. With a cast-iron spider or hub, with arms cast around, with lugs on them outside.

Q. 10. Outside of what?

A. At the outer end of the arms; and a wrought-iron rim riveted on—formed up and riveted on.

Q. 11. What were the sizes of those pulleys, as near as you can recollect?

A. Those were five feet in diameter.

Q. 12. Do you remember what the distance across the face of them was?

A. I recollect they were not very wide. As near as I can recollect, they were about eight inches.

Q. 13. How came you to make those pulleys on that occasion?

132 A. I had patterns of all sizes of cast iron up to four feet, and we required some five-foot pulleys to fill an order, and we built them in that way to save making a pattern of the rim, which is the most expensive part of a pulley pattern.

Q. 14. How were the rims at that time manufactured? Please detail the process.

A. We take a straight piece of boiler iron and cut it off the right length and punch the holes in the end and roll it up with boiler rolls—roll it the same as a ring for a boiler; then we riveted the ends together with a piece underneath, inside.

Q. 15. After the spiders for those pulleys were cast, what, if anything, was done to make the ends of the arms concentric with the axis of the pulley?

A. Put the spiders on the face plate of the lathe, bored them out, and turned off the lugs.

Q. 16. What part of the lugs did you turn off?

A. The outside face.

Q. 17. What kind of a lathe was used?

A. I had an ordinary lathe, with a seven-foot swing, that I used for that work.

Q. 18. Do you know whether or not the ends of those arms were made exactly concentric with the axis of the pulley?

A. As near as mechanical work can be done, it would be practically concentric. The only difference from being perfectly concentric would be that an arm might be a little harder than another and the tool would spring off a little; that is the only difference.

133 Q. 19. Do you recollect whether there was any crown on the rims of those pulleys or not?

A. No, sir; there was none—a straight face.

Q. 20. How long, if at all, have you known of the rims of belt pulleys being finished by grinding?

A. The first I recollect of pulleys being finished by grinding was in 1847, in Philadelphia. I bought some pulleys that came from Jenks, at Bridesburg, about eight miles above Philadelphia. He manufactured cotton machinery, shafting, and pulleys, and I had some of his pulleys. They were smooth and showed no tool marks, and I enquired why it was and was informed that they were ground, and the shafting that he manufactured at that place was all ground, too.

Q. 21. Do you know whether or not it has been a common practice with mechanics or manufacturers to grind the surface of pulleys of different kinds when they were hard?

A. When they were too hard to turn; yes, sir.

Q. 22. Please state somewhat in detail what you know about the practice and whether it existed prior to 1880.

A. Well, it was so common that we didn't think anything about it, only that it was a little objectionable; but we done it whenever it was necessary. We considered it a disagreeable thing to do, because we were not fitted up to do it to the best advantage.

Q. 23. When the pulley is finished state whether or not it makes any difference in the pulley itself whether it is made concentric by grinding the ends of the arms or by dressing them in any other of the usual ways known to mechanics.

134 A. There would be no difference.

Q. 24. Would it have any effect whatever on the pulley itself after it was finished?

A. No; none.

Q. 25. I will read you an extract from the patent, "Exhibit C," in this case, as follows: "The crown or dish *d*, usual to belt pulleys, is formed on the rim D by bending or dishing the rim during the process of manufacture, preferably at the same time and by means of the same rolls that bend the rim into the required circular shape." State whether or not you understand what is described in that extract.

A. Yes, sir.

Q. 26. Take the first three lines of that extract, as follows: "The crown or dish *d*, usual to belt pulleys, is formed on the rim D by bending or dishing the rim during the process of manufacture." Now, taking those three lines by themselves, could you tell whether or not the crowning was done at the same time that the rim was bent into a circle?

A. Yes, sir; I should think so. I don't see how else you could do it economically.

Q. 27. I will read you an extract from the patent, "Respondents' Exhibit Mathers Patent," in evidence in this case, which describes a metal rim *fro* a pulley as follows: "This driving surface or rim constitutes a separate band or strip of sheetiron or steel of a suitable thickness and of any breadth required, and is bent into form by passing it repeatedly through and between a pair of bending rolls of hard or chilled metal for the purpose of bringing it to the diameter required. The driving wheels thus formed may be made
135 flat or convex in cross-section by means of suitable rolls, the curvature and cold rolling greatly increasing the rigidity and improving the rim as a driving surface." Do you understand the mechanical operation described in that extract?

A. I do.

Q. 28. Please state whether you find any difference between what is described in the extract I have read to you from the patent, "Exhibit C," and what is described in the extract I have read to you from the Mathers patent.

Mr. Eccles: That is objected to because the witness is asked to compare the two mechanical constructions or operations without first stating what *what* they are, and because the question tends to suggest an answer.

A. The only thing that I see is that it describes the effect that would be produced by the first operation more. It describes what the effect would be—that is, the hardening of the iron by compression, either by hammering or by rolling cold. It merely appears to describe the effect described by the first description.

Q. 29. Please describe what difference there is, if any, between the mechanical operation which is described in the extract from the patent, "Exhibit C," and that which is described in the extract from the Mathers's patent?

A. Well, I don't see any difference. One tells how to do it, and the other tells how to do it and describes the effect. That is all the difference I see. To my mind, either is perfectly plain, how to proceed. In fact, any mechanic would know how to proceed
136 without any description, if you only told what you wanted to accomplish, in my estimation.

Q. 30. Do you know whether the pulleys which you made in 1853, as you have described, were practicable, merchantable pulleys or not?

A. We used them to fill out orders, and I made several lots of them, perhaps a dozen of them at different times, and we used them in the regular course of our business—that is, they were made to order, and were used by the parties who ordered them.

Q. 31. Do you know whether they were practical operative pulleys or not?

A. They were used and I never heard any complaint of them. We built machinery afterwards for the same parties, and we never heard any complaint of them. I think I used one of the pulleys myself in the shop. I think I used one to run the fan or blower in the foundry. I am not quite positive, but I am pretty sure we did.

Cross-examination of E. T. STEEN.

(Mr. ECCLES:)

Q. 1. Did you ever read the specifications of the Mathers patent referred to in your examination-in-chief?

A. I don't know it by the name.

Q. 2. Well, I mean the one referred to in your examination-in-chief, the English patent, the Mathers patent.

137 A. I think that Mr. Wheaton read it to me.

(By Mr. WHEATON:)

Q. 3. The question is whether you ever read it yourself.

A. No, sir; I never did. I didn't recognize it as having read it before when Mr. Wheaton read it to me. Several patents were read to me and I didn't recognize, when Mr. Wheaton read it to me just now, which it was.

(By Mr. ECCLES:)

Q. 4. Did Mr. Wheaton read over to you the Medart patent at the same time that he read over to you the Mathers patent—that is, the one referred to?

A. He read some portions of that; yes, sir; I think, the gist of of the patent. I think one patent he read entirely through, if I recollect right.

Q. 5. Did he ask you when he read those patents through whether the rim on the pulley was not formed the same in both patents?

A. He asked me if there was any difference.

Q. 6. And you told him there was not?

A. Yes, sir.

Q. 7. You didn't take those patents in your hands and study them, as you would a specification, yourself?

A. Do you mean as if I was going to write a specification?

Q. 8. Yes.

A. No, sir; I did not.

Q. 9. Did you see any rolls shown in the drawing of the patent by means of which a rim was formed, in the Mathers patent an extract of which was just read to you by Mr. Wheaton?

A. I didn't see any cut of any rolls at all.

Q. 10. You didn't see any rolls?

A. No, sir.

Q. 11. Do you know whether there are any drawings con-

138 nected with the Mathers patent an extract of which was just read to you?

A. No, sir.

Q. 12. Then this was rather a hasty conclusion of yours, wasn't it, that the two rims were made in the same way by the two patents?

A. No, sir; I think it was an intelligent conclusion.

Q. 13. You think that you understand from the specification just read to you, and that read to you by Mr. Wheaton prior to your testimony here, of the Mathers patent that the rim was bent into a circle and crowned at one and the same time?

A. If necessary to crown it; yes, sir; if they wish it crowning. If they wanted a flat-surfaced pulley they wouldn't crown it, and if they wanted a round pulley they would crown it with the same operation as the bending.

Q. 14. Then you think, and you are quite sure, that the specification of the Mathers patent says that a rim of a pulley made according to that patent must be made (if you want a crowned pulley) crowned and bent into a circle at one and the same time?

A. According to the language of that patent, yes.

Q. 15. And you think you cannot be mistaken in the language of that patent?

A. I think I can be mistaken on anything in the world, but I don't think I am in that case.

Q. 16. Will you state, in your own words, just how this Mathers patent says the rim is made.

A. Do you mean for me to say in my own words the idea
139 that that patent gives to me.

Q. 17. Yes; that is what I want, exactly.

A. As I understand that patent?

Q. 18. Yes.

A. Well, that patent substantially states that if the rim is to be crowned, it is done at the same operation as the bending of it up to fit the size of the pulley.

Q. 19. Does it indicate what kind of rolls you should use?

A. Yes, sir; to any mechanic.

Q. 20. What are they?

A. A roll that would be rounded on its face; or, in two ways, it would be a circle one way and a portion of a much flatter circle the other way.

Q. 21. Well, what would be a portion of a circle one way and a much flatter circle the other way, the rim or the rolls?

A. Both, when finished.

Q. 22. I will read to you a portion of the specification of the Mathers patent referred to: "This driving surface or rim constitutes a separate band or strip of sheet iron or steel of a suitable thickness and of any breadth required, and is bent into form by passing it repeatedly through and between a pair of bending rolls of hard or chilled metal for the purpose of bringing it to the diameter required."

Now, is there anything in that language which states that the rim is to be ground?

A. No.

Q. 23. Now, the next sentence is: "The driving rims thus formed may be made flat or convex in cross-section by means of suitable rolls." "The driving rims thus formed." Now, what is
140 meant by "The driving rims thus formed"?

A. Well, as I understand that, if you want a convex——

Q. 24. (Interrupting.) Never mind that part, but take these words, "The driving rims thus formed."

A. Formed by bending.

Q. 25. Bent into a circle. "The driving rims thus formed." What is meant by those terms?

A. Well, before that——

Q. 26. (Interrupting.) Before that I have read you, "and is bent into form by passing it repeatedly through and between a pair of bending rolls of hard or chilled metal for the purpose of bringing it to the diameter required."

Now, then, that is bending it into a diameter?

A. Yes, sir.

Q. 27. Now, he says: "The driving rims thus formed." Now, does that mean bending that rim into a diameter?

A. Yes, sir.

Q. 28. Now, we have got the rims bent into a diameter. "The driving rims thus formed may be made flat or convex in cross-section by means of suitable rolls"?

A. Yes, sir.

Q. 29. Then they are made into suitable rolls?

A. No, sir.

Q. 30. Then what do you mean?

A. Because you would have to go over it twice.

Q. 31. Well, but we are talking about what this language says.

A. I am saying what I would do from reading that and going on to do a job.

141 Q. 32. Then you are saying what you would do if you should read this and then went on to execute a job?

A. I would use the skill of a common mechanic.

Q. 33. Then you wouldn't follow this specification?

A. Yes; I would. If he was making this concave rim he would use a suitable roll to make it concave the first time, because it would be all nonsense to do it twice.

Q. 34. Then you would say that you would use these rolls to crown it and bend it round simply because it would be nonsense to do it any other way?

A. Yes, sir; certainly. It would be throwing away your time to do it any other way.

Q. 35. That would be your reason and not because this specification says so?

A. It says that if you want a convex pulley you make them concave.

Q. 36. Then what is the use of saying "the driving rims thus formed"?

A. Because they would be "thus formed."

Q. 37. What is meant by those words?

A. I don't think you should take one word of the specification my itself; you should take it as a whole.

Q. 38. But you are jumping at a conclusion from what you know, are you not, instead of what you take from this specification?

A. As I understand, the specifications are addressed to parties who are accustomed to doing work of the same kind and if

142 the specifications describe it so that a person of ordinary mechanical skill understand- the meaning of the patent speci-

fications, it is clear enough to answer the law. Now, if that is the case it is clear enough to me to make the pulleys convex at the same time that I form them up by that specification. Of course I am supposed to know how to use the rolls or turn a crank or belt a pulley. I must have a little sense. I can't start out a wooden man and do it. That is the way I look at it.

Q. 39. Did you ever, as a mechanic, before the time this patent was issued, which was in 1873, make a convex or a crowned rim on a pulley bent around and fastened to a spider?

A. I don't remember of making a wrought-iron convex one. I never made more than two or three at a time of wrought-iron rims. It would not pay to fit up for it.

Q. 40. Then you think that even if you never made a rim of wrought iron that was crowned, yet if you would read that specification that you would make it at one and the same time, if you wanted to make it?

A. Undoubtedly I should.

Q. 41. And that specification would tell you to?

A. I wouldn't need any specification; that specification is sufficient.

Q. 42. And you immediately jump at the kind of rolls to be used?

A. I don't know whether you call it jumping at it, but a man has to use a little sense in anything.

Q. 43. But you simply mean that it is jumping at how it is made?

A. Well, I don't call it so. I just call it an every-day cus-
143 tom of accomplishing an end.

Q. 44. And you mean to say that if you had that evidence, this patent, you could have made a composite pulley with a crowned rim?

A. If the job had paid me to fit up for it, I should undoubtedly have made crowned rims, because we always turn a pulley crowning a little except when the belt is to be shifted, and then you want a straight pulley.

Q. 45. And you think, without any effort on your part, you would have made the same pulley that the Medarts made?

A. I think it is a pulley that I would have made if I had had occasion to. At the time I made those pulleys in 1853 we didn't consider them anything new.

Q. 46. But would you have made a crown there just as this specification would tell you to do?

A. Yes; if the job had paid me to do it, I would have fitted it up with rolls.

Q. 47. You didn't think of it then?

A. Well, I did, but I didn't think it would pay me to do it. It don't pay a man to spend five dollars to earn one.

Q. 48. Then you think the words "the driving rims thus formed" don't mean anything in the specifications in the Mathers patent?

A. Well, they don't amount to much, anyway. He might have left them out just as well.

Q. 49. Yes; he might have made a different rim to a pulley, too?

A. Yes, and if he had left that out it would not have
144 made a bit of difference in the pulley, either. My understanding is that those words mean nothing. Those words mean nothing to me; they would convey no idea to me.

Q. 50. Well, up to that point there had not been any expression in that specification of a convex rim, had there?

A. When he says he wants to make a crowned rim there, he can do it.

Q. 51. But he don't say so until he comes down here below.

A. Then leave those words out. They are unnecessary. They are merely black words on the page.

Q. 52. Then leave those words out. "The driving surface or rim constitutes a separate bend or strip of sheet iron or steel of a suitable thickness." Those are black words on the page, too, are they not?

A. That goes on to tell what he makes; that is all.

Q. 53. "And of any breadth required, and is bent into form by passing it repeatedly through and between a pair of bending rolls." Now, that might as well be left out, too, mightn't it?

A. He might have said, "by passing through bending rolls," and that is all that is sufficient.

Q. 54. "Of hard or chilled metal"?

A. You might throw that out. Just "metal" is all that is sufficient. We don't want wood, for that is too soft.

Q. 55. "For the purpose of bringing it to the diameter required" is all unnecessary, too, is it?

A. No, sir; you want that in.

145 Q. 56. Well, what is meant by that?

A. Bringing it to the size required is what is meant.

Q. 57. That is bending it into the circle, isn't it?

A. Well, that is the size that is required.

Q. 58. Well, that don't say that the pulley rim should be crowned, does it?

A. No, sir; not yet.

Q. 59. Now, that pulley is bent into a circle. Now, "the driving rims thus formed"—that is, bent into a circle—"may be," if required (those words, if required, are interpolated), "made flat or convex in cross-section by means of suitable rolls."

A. Exactly; you have got to make the words different in order to make it convex than if you wanted to make a straight face.

Q. 60. Then, that is all that means?

A. Yes, sir.

Q. 61. "The driving rims thus formed," then, don't refer to bending it into a circle?

A. Well, it is not necessary.

Q. 62. Well, does it refer to it or does it not? that is all I care for. Does that language refer to bending it into a circle or does it not? "The driving rims thus formed," does that refer to what goes before, by bending that rim into a circle, or does it not? Just answer that question and not branch off on what you think is necessary or what is not necessary. Now, do the words "the driving rims thus

formed" refer to the bending of that rim into a circle or do they not?

A. They refer to a rim that has been bent into a circle; yes; but those words don't state that you must necessarily put it into a circle first.

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Q. 63. But they refer to a rim bent into a circle?

A. Yes, sir.

Q. 64. Now, the rim bent into a circle, it says there, "may be made flat or convex in cross-section by means of suitable rolls." Now, does not that mean that after a rim is bent into a circle that it may be made flat or convex by the use of suitable rolls, after it is bent into a circle?

A. No, sir. The words are not properly located there, because here he says, "may be made flat or convex in cross-section." Now, it must be either flat or convex when it is formed up. Now, they are all right, one or the other, and therefore "the driving rims thus formed may be made flat or convex in cross-section by means of suitable rolls." Now, they must be made flat or convex, one that will form one or two, and therefore it is as distinct as any language can be that it is done when the rims are rounded up. Now, it depends on the kind of rolls, whether they are flat or convex.

Q. 65. Well, you could make it convex by rolls after it was rolled into a circle?

A. Oh, yes; you could do it; yes, sir.

Q. 66. And you think these words, "the driving rims thus formed," are all nonsense and no business to be there?

A. Yes, sir; those words are superfluous which say "the driving rims thus formed." They should be left out. "May be made flat or convex in cross-section by means of suitable rolls." The

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words "thus formed" should be left out. You can't make any sense out of it in any way.

(Examination continued, in conformity with agreement of counsel, until Monday, August 5th, 1889, at half past ten o'clock a. m.)

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MONDAY, *August 5th*, 1889.

Present: Mr. Eccles, of counsel for complainants; Mr. Wheaton, of counsel for respondents.

Cross-examination of E. T. STEEN (continued).

(By Mr. ECCLES:)

Q. 67. Mr. Steen, does a pulley two feet in diameter require the same crown as a pulley five feet in diameter would?

A. As far as I have ever thought of it, yes, sir.

Q. 68. And so a pulley six inches in diameter would require the same crown to work equally as well as a two-foot or five-foot pulley? I speak of the diameter of the pulley in each case.

A. I don't see any reason why it should not. All it requires a crown for is to cause the belt to remain on the pulley. A belt always runs to the highest point.

Q. 69. Did you ever attempt to put a crown in the rim of a composite pulley after it had been bent into a circle?

A. No, sir.

Q. 70. Did you ever attempt to bend the rim of a composite pulley into a circle after the crown had been put into it?

A. No, sir.

Q. 71. Can you tell me how you find the circumference of a circle when the diameter is given?

A. Yes, sir.

Q. 72. Now, Mr. Steen, will you figure out the difference
149 in length between the outer edges of the rim of this pulley marked "Complainants' Exhibit Respondents' Pulley" and the center or crown part, as near as you can?

A. Suppose I just give it from the table, would that answer the purpose?

Q. 73. Well, wait until I ask the questions. The difference in the diameters being a quarter of an inch.

A. What are the diameters?

Q. 74. The diameter of the outside would be two feet on one and the other would be two feet and a quarter of an inch.

A. I will give it to you from the table, and then I will not make any mistake about it. Twenty-four inches in diameter is seventy-five and thirty-nine hundredths inches, and twenty-four and a quarter is seventy-six and eighteen hundredths inches.

Q. 75. Therefore, if that rim was turned into a circle before it was crowned, and then crowned afterwards, the edges would necessarily have to be contracted or the center expanded seventy-nine hundredths of an inch, would it not?

A. Yes, sir; or they might be expanded half and contracted half, or any other proportion.

Q. 76. Therefore, if the crown and the circle were not made at the same time, there would be some difficulty in bending the rim into a circle and at the same time preserving the crown, or in crowning the rim after it was bent into a circle and at the same time preserving the circle, would there not?

150 A. Yes, sir; it would be liable to distort the rim and it might have to be formed over again. It would be more convenient and cheaper to complete it at one operation.

Q. 77. Mr. Steen, will you examine the crown on the pulley marked "Complainants' Exhibit Respondents' Pulley" and state to me whether, in your opinion, that rim was bent into a circle and crowned at one and the same time and by one and the same set of rolls, or whether it was done at different times?

A. I should say it was.

(By Mr. WHEATON:)

Q. 78. That is your opinion from the appearance of this pulley?

A. Yes, sir; still I don't consider that by any means positive.

(By Mr. ECCLES:)

Q. 79. Well, we are just asking your opinion as an expert.

A. Yes, sir; so I understand.

Q. 80. Have you ever been in the shops of the Risdon iron and locomotive works in the last five years?

A. Yes, sir; often.

Q. 82. Have you seen them manufacturing their pulleys there?

A. No, sir; I never saw that work going on.

Re-examination of E. T. STEEN:

(It is admitted by both complainant and respondent that the pulley now produced is a pulley manufactured and sold by
151 Clot & Meese, the complainants' licensees, and to have been made under one of the patents sued on in this case.)

(The said pulley is here introduced in evidence by respondent and marked "Respondents' Exhibit Clot & Meese Pulley.")

(By Mr. WHEATON:)

Q. 1. Mr. Steen, did you just see the pulley, the last exhibit put in evidence, tested to see whether it was perfectly balanced or not?

A. I did.

Q. 2. Is it perfectly balanced or not?

A. It is not.

Q. 3. Please state whether or not the compression and expansion which occurs in the crowning and bending of a rim such as is shown on the pulleys in evidence will necessarily be the same whether they are bent and crowned at one operation or whether they are bent at one operation and crowned at another.

A. Well, that is so fine a point that I couldn't say. I could not be sure about it. There is so slight a difference that the only way to test it would be to try it by actual experiment.

Q. 4. On your cross-examination you were examined very critically as to your opinion of the language contained in the English Mathers patent, where it says: "This driving surface or rim constitutes a separate band or strip of sheet iron or steel of a suitable thickness and of any breadth required, and is bent into form by passing it repeatedly through and between a pair of bending rolls of hard or chilled metal for the purpose of bringing it to the diameter required. The driving rims thus formed may be made
152 flat or convex in cross-section by means of suitable rolls, the curvature and cold rolling greatly increasing the rigidity and improving the rim as a driving surface." Now I will ask you whether in your opinion the words "bent into form," where it first occurs in the expression "is bent into form by passing it repeatedly through and between a pair of bending rolls," contains any implication that the form there mentioned is flat and not crowned?

A. As I understand the question, I don't think it does. It must have one of the two. As I understand it, it might be either flat or crowned in the first rolling.

Q. 5. As you understand the entire expression, where it speaks of the driving surface or rim being bent into form, does that mean the driving surface or rim after that surface is completed, or does it mean it before it is completed?

A. "Bent into form," as I understand it, would mean the finished form.

Mr. ECCLES: That question and answer are objected to because the witness is not asked to explain a technical term, but to construe language.

Mr. WHEATON: Respondents' counsel states that he thinks the objection applies to the questions asked the witness in cross-examination as well as to the present one. I am only asking the witness these questions in explanation of the cross-examination.

(By Mr. WHEATON:)

Q. 6. Is there anything, in your judgment, in this language, "The driving rims thus formed may be made flat or convex in
153 cross-section," which indicates that they are not thus made flat or convex in cross-section when they are first made?

Mr. ECCLES: The same objection.

A. No.

Q. 7. Please look at the drawings in the English patent, "Gubbins patent," in evidence here and state whether from those drawings you can tell whether the pulley therein shown is made with a wrought-iron rim or cast iron?

A. It is made of sheet metal of some kind.

Mr. ECCLES: That question is objected to for the reason that the court is as good a judge of that as the witness.

Recross-examination of E. T. STEEN:

(By Mr. ECCLES:)

Q. 1. Is not the pulley, "Respondents' Exhibit Clot & Meese Pulley," which you testified about sufficiently balanced for all practical purposes?

A. I think it is.

Q. 2. What did you mean by saying that *is* was not perfectly balanced?

A. That it is not exactly balanced.

Q. 3. Did you ever see a pulley that was exactly balanced?

A. I don't think I ever did; not to my knowledge.

Q. 4. Is not this pulley as perfectly balanced as any that you ever tested?

A. I think so.

154 Q. 5. Mr. Steen, do you know anything about a composite pulley, such as those are in evidence, superseding in the market the old cast-iron pulley? Do you know whether they have superseded in the market the old cast-iron pulleys since they were introduced?

A. Well, not entirely. There has been a great many of them sold.

Q. 6. Haven't they to a large extent superseded the old cast-iron pulley?

A. Well, I am not familiar with the market for the past three or four years because I have been in other business, and at that time they were not so much a favorite as they had been before, that is as far as I can say; I think it was on account of their not being quite strong enough for a great many purposes.

Q. 7. But at one time, to your knowledge, they were a favorite pulley and did largely supersede the old cast-iron pulley?

A. Yes, sir; largely.

(By Mr. WHEATON:)

Q. 8. As to the Clot & Meese pulley in evidence, did you put any weights on the opposite or lower side to see how much out of balance it really was?

A. No.

(By Mr. ECCLES:)

Q. 9. But you did see it roll back and forth a number of times before it came to a rest?

A. I did.

(By Mr. WHEATON:)

Q. 10. Since your last answer, have you seen the said pulley tested by putting a two-and-a-half ounce weight on the outside of the rim on its lightest side?

A. Yes, sir.

155 Q. 11. Did you also see the two-and-a-half-ounce weight changed and put against the inner periphery of the rim on the lightest side of the pulley?

A. Yes, sir.

Q. 12. Please explain just how *nearly* that two-and-a-half-ounce weight came to making the pulley balance when the weight was placed in the two positions mentioned, one being on the outer periphery of the rim and the other being on the inner periphery of the rim.

A. On the outer periphery it is too great and on the inner periphery it was as near as possible to an exact balance, I should say.

Q. 13. Do the set-screws through the hub of the pulley project above the hub towards the circumference?

A. Yes, sir.

Q. 14. Is there any weight to the projections of those set-screws?

A. Yes, sir.

Q. 15. Does the extra weight of the projecting portions of those set-screws come upon the lighter side of the pulley or upon the heavier side?

A. Upon the lighter side.

(By Mr. ECCLES:)

Q. 16. Does that amount of two and a half ounces make any particular difference in the practical operation of that pulley?

A. Not at any ordinary speed.

156 *Deposition of Meese.*

TUESDAY, *August 6th*, 1889.

Present: Mr. Eccles, of counsel for complainants; Mr. Wheaton, of counsel for respondents.

Re-examination of CONSTANT MEESE on behalf of complainants.

(By Mr. ECCLES:)

Q. 1. Mr. Meese, have you read the specifications in the English patent of Robert Mathers, dated 1873, with regard to the making of the rim of a pulley?

A. I have.

Q. 2. Have you examined it carefully?

A. I have examined it very carefully.

Q. 3. Will you state whether, following those specifications, a mechanic would make the rim of a pulley crowned and bent into a circle at one and the same time and by one and the same rolls or whether he would make it at different times and with different rolls?

Mr. WHEATON: That is objected to unless it is shown that the witness was acquainted with the state of the art at the time that that patent was published.

Mr. ECCLES: I will withdraw the question for the present.

Q. 4. Mr. Meese, how long have you been in the iron business?

A. Twenty years.

157 Q. 5. Were you acquainted with the state of the art of manufacturing pulleys and other like devices in 1873?

A. I was.

Mr. ECCLES: Now, I will repeat the question.

Mr. WHEATON: One moment.

(By Mr. WHEATON:)

Q. 6. Were you acquainted with that branch of iron manufacture which referred to the rolling of sheet iron where the iron was formed into circles, such, for instance, as for boilers and other purposes?

A. I was.

(By Mr. ECCLES:)

Q. 7. (Q. 3 repeated.)

A. By following the specification I should make a rim-crowning by several operations, using several sets of rolls.

Q. 8. State whether a mechanic following those specifications would bend the rim into a circle first and then attempt to crown it afterwards.

A. That would be my way of doing it according to that specification.

Q. 9. At that date will you state whether there were any rolls known to the art or used in the art that would bend a piece of iron into a circle and crown it at the same operation?

A. At that date I knew of no rolls to accomplish that.

Q. 10. When did you first know of rolls in the art that would accomplish both of those operations at one and the same time?

A. About 1883.

Q. 11. How did you come to learn of them? And state what occurred at the time or about the time that you so learned of those rolls.

158 A. About that *we* time we saw an advertisement of the Medart patent pulley, and my partner, Mr. Clot, and myself investigated a little, but couldn't find how we could make a pulley cheap by grinding out so much metal on the outside of the rim. We at that time could not conceive how a rim could be bent convex. We then looked up the patents in the Mechanics' Library and saw these rolls, and that it was a good idea, and we investigated his patents further and wrote on to Medart.

Q. 12. When did the Risdon iron and locomot-e works first commence manufacturing their composite pulley, to your knowledge? Was it before or after you commenced to manufacture the Medart pulley under your license?

A. It was after we started to manufacture the Medart pulley under our license.

Q. 13. State whether or not it was after you had advertised the Medart pulley extensively or otherwise.

A. It was after we had advertised the Medart pulley.

Q. 14. State whether or not it was after you had acquired a large trade in the Medart pulleys.

A. It was after we had acquired a considerable trade, quite a large trade.

Q. 15. Do you know whether the defendants prohibited outsiders from entering their rooms there, where they manufactured their pulleys?

A. I don't know it from personal observation, but I have sent——

159 Mr. Wheaton: I object to the witness stating anything that he does not know of his own personal knowledge on the ground that it is incompetent, being hearsay.

(By Mr. Eccles:)

Q. 16. Go on, Mr. Meese.

A. But I have sent our foreman, who manufactures pulleys at our place, there to see how they, the defendants, make their pulleys.

Q. 17. And what was the result?

A. He was not given permission to go through the works, and then, through a little strategy, he did manage to enter.

Q. 18. Will you look at this pencil sketch, marked "Complainants' Exhibit Birch Draft," and state if the parts marked "rolls" were iron rolls, and the part marked "rim of pulley" was a piece of iron, and the part marked "iron piece" was a long piece of iron

running longitudinally with the unbent rim, and, if those rolls were ordinary boiler-iron rolls, whether the rim of a pulley such as is on the pulley marked "Complainants' Exhibit Respondents' Pulley" could be crowned by any such rolls, in your opinion.

Mr. WHEATON: That is objected to unless the witness has made tests or had some experience by which he would know how much of a spring there is in rolls of that kind.

A. I should state that that rim could be bent but very little—in fact, hardly any—unless the roll sprung enormously, and then it would break the roll, and then it would not bend the rim.

160 Q. 19. In order to bend the rim it would have to bend the rolls?

A. It would have to bend the rolls.

Q. 20. Now, Mr. Meese, can you tell me what was meant by the technical term, in 1873, "bending rolls," in the art?

A. Under that term we understood rolls for bending boiler shells or bending wagon tires or hoops.

Q. 21. State whether the term "bending rolls" applied to rolls other than straight-surfaced rolls at that time or whether they applied to rolls that had a convex periphery or a concave periphery—the term "bending rolls."

A. Well, the term "bending rolls" would apply to straight rolls, in my estimation, at all times.

Q. 22. On an eighteen-inch pulley, Mr. Meese, such as you manufacture under the Medart patents, would two ounces and a half more weight on one side of the pulley than on the other interfere materially with the practical use of that pulley, or, in other words, would not such a pulley be considered now as substantially a perfectly balanced pulley?

A. It would be considered as a perfectly balanced pulley in the trade ordinarily.

Q. 23. And would not interfere with the——

A. (Interrupting.) With the ordinary workings of the pulley.

Q. 24. At such a rate of speed as they are usually used?

A. As they are usually used.

Q. 25. Mr. Meese, will you state whether the pulley which I show you and which I ask the examiner to mark as "Complainants' Meese Pulley" is manufactured by you or not?

161 A. That pulley has been manufactured by us.

(The pulley last above referred to, marked "Complainants' Meese Pulley," is introduced in evidence by complainant.)

Q. 26. State whether or not, Mr. Meese, your pulleys are usually or not more perfectly balanced as they are manufactured than one having two and a half ounces more weight on one side than on the other.

A. They are usually more perfectly balanced than that.

(By Mr. WHEATON:)

Q. 27. Have you tested them to see whether the majority of them are more perfectly balanced than that?

A. Oh, yes. When we first started in we tested them.

Q. 28. Did you ever find one of those you tested that was exactly balanced?

A. That I couldn't state. I know that we found them so nearly balanced that we let them go when inquiry was made for a perfectly balanced pulley.

(By Mr. ECCLES:)

Q. 29. And that, even though you knew they were going to be used at a very high rate of speed?

A. Oh, yes, frequently. It is very seldom that we rebalance one of these pulleys, and they run at enormous rates of speed.

Q. 30. Will you state whether you have ever heard any complaint since you commenced manufacturing the pulleys about them not being perfectly balanced?

A. We have had no complaint entered to that effect.

162 Q. 31. Just state how you form this rim under the Medart patents, as you manufacture them; how you form these crowned rims.

A. We run the rim through a set of rolls, the two lower rolls being concave and the top roll convex.

Q. 32. That does what?

A. That makes the rim convex. That forms the rim and makes it convex on one side and concave on the other at one and the same operation.

Cross-examination of CONSTANT MEESE.

(By Mr. WHEATON:)

Q. 1. How many times do you run one rim through the rolls before it is completed and put in perfect form?

A. The sheet of iron, after being placed in the rolls, is rolled around three or four times without being taken out of the rolls.

(By Mr. ECCLES:)

Q. 2. It is then completed?

A. Yes, sir; it is then completed.

(By Mr. WHEATON:)

Q. 3. Are those "bending rolls" that you run it through?

A. We call them "crowning rolls." They are also "bending rolls." They are "bending rolls" and "crowning rolls" combined.

Q. 4. Are those "bending rolls" suitable for bending the

163 rims into a circle, and also crowning them in cross-section?

A. They are suitable for bending them into a circle and crowning at one and the same time, but they will not bend them into a circle without crowning.

Q. 5. Do you run each one of those rims repeatedly through bending rolls which are suitable for forming that rim in a circle, and also crowning at the same time?

A. We sometimes run it through only once, and at other times three or four times.

(By Mr. ECCLES:)

Q. 6. Owing to the weight of the——

A. (Interrupting.) Owing to the size of the pulley and the nature of the metal we are handling.

(By Mr. WHEATON:)

Q. 7. Well, do you usually in manufacturing those rims run each one of them through bending rolls which are suitable for forming the rim into a circle and crowning it at the same time?

A. Yes; we do.

Q. 8. When did you ever know any crowned rims or anything similar to crowned rims to be run through rolls which bent them into a circle, but left them straight in cross-section, and afterwards run them through other rolls which crowned them?

A. I never knew that to be done.

Q. 9. Then why do you say a mechanic, in 1873, would have done — under this English patent—the Mathers patent?

A. Because he was advised through that patent how to do it.

Q. 10. How would the state of the art advise him to do it under that, when the patent itself does not so advise him, as it had
164 never been so done prior to that time, to your knowledge?

Mr. ECCLES: That is objected to as misleading, because the patent says exactly how it shall be done.

A. Well, I don't know how I should do it.

Q. 11. (Q. 10 repeated.)

A. I don't know as I can understand that question thoroughly.

Q. 12. (Q. 10 again repeated.)

A. Well, I should not be able to bend a rim into a circle and crowning at one and the same operation. Even following these specifications, I will admit that I would not be able to do it at one and the same operation. When I first saw this specification I thought they had two rolls to do this operation.

Q. 13. When did you first see this specification?

A. Yesterday afternoon.

Q. 14. And you had been making these rims in which you bent them into a circle and crowned them by means of suitable bending rolls a good many years before you saw this?

A. Yes, sir.

Q. 15. And still you say when you saw them yesterday afternoon you wouldn't know how to do it?

A. If those specifications had been shown to me before I knew anything about crowning rolls I would not have known how to do it.

Q. 16. Well, would anybody that didn't know how to do it?

165 A. They might have had the idea.

Q. 17. In the first part of the expression, where it says "this driving surface or rim constitutes a separate band or strip of sheet iron or steel of a suitable thickness and of any breadth required and is bent into form by passing it repeatedly through and

with the ends of the spiders. That is the only variation that
169 I know of that we have made from that specification.

Q. 37. Will you please point out in the specification of the patent, "Exhibit B," where it says anything about getting the hub centered with the ends of the arms?

A. (Reading from the specification referred to:) "In making my pulley, the cast spider A is centered and bored."

Q. 38. Please take the drawing and the description and state whether the cast spider "A" does not include the arms and the lugs on the ends of the arms as well as the hub.

A. It does.

Q. 39. Now, try again and see if you can find anything in that specification that mentions making the hub perfectly centered with the ends of the spider.

Mr. Eccles: That is objected to on the ground that it has already been answered.

A. I cannot find anything referring to that except the quotation that I made.

Q. 40. Now, after reading the specification, state whether you vary from those specifications in manufacturing the Medart pulley or not.

A. (After reading the specification referred to.) I do not find that in manufacturing these pulleys we vary from these specifications any.

Q. 41. In casting these spiders according to those specifications, in what portions of the spiders will irregularities occur?

A. There is nothing said in these specifications about
170 casting spiders. It simply states that "in making my pulley the cast spider A is centered and bored."

Q. 42. Could you get a "cast spider" without casting it?

A. No, sir.

Q. 43. You find those specifications speak of the irregularities that occur in this "cast spider," do you not?

A. Yes, sir.

Q. 44. Now, in what portion of those spiders will those irregularities occur in practice?

A. In practice they will occur in the hub, not being placed centrally to the spider.

Q. 45. Do irregularities occur in the arms at all?

A. Not in practice.

Q. 46. Won't those arms come out of unequal lengths—come out of the sand in which they are cast in unequal lengths?

A. They will come out in unequal lengths.

Q. 47. What is that owing to?

A. Owing to defective moulding.

Q. 48. Well, then, there are irregularities in the arms, are there not, in practice?

A. Yes, sir.

Q. 49. Now, do you find anything in the specifications of that patent, "Exhibit B," which will correct the irregularities which

occur in casting the hub or which occur in any portion of the arms except the extreme ends of the arms?

A. No, sir; I do not.

Q. 50. Now, suppose two of the arms on opposite sides of the hub of the cast spider are of unequal length, how do you correct that?

A. By grinding the ends of them off.

171 Q. 51. In that case do you not grind more metal off of the end of the longer arm than you do off of the end of the shorter arm on the opposite side?

A. In that case we would.

Q. 52. Well, in such case doesn't it leave that side of the pulley lighter in which the arm came out of the mold the longer?

A. It does.

Q. 53. Well, do such irregularities occur in practice?

A. They do not occur in practice. Practically, before boring the spider, we true it up by the ends of the arms.

Q. 54. What do you true it up in?

A. In a boring mill.

Q. 56. Well, in that case, if the hub is not perfectly concentric with the ends of the arms, you never get it perfectly concentric, do you?

A. No, sir.

Q. 57. Well, wouldn't then, in such cases, your pulley be always out of balance?

A. In such cases the pulley would be out of balance.

Q. 58. Is there in practice any such thing as making a perfectly balanced pulley?

A. There is in practice such a thing as making a practically balanced pulley, but not a perfectly balanced pulley.

Q. 59. Have you not seen cast-iron pulleys made just as perfectly round and quite as well balanced as these Medart pulleys are made?

A. I have not.

Q. 60. Have you never seen a cast-iron pulley cast with a web instead of arms, in which the center of the pulley was bored out and then the entire pulley turned—that is, the hub turned

172 true, the web on both sides turned true, and the rim turned true both inside and out and on its edges?

A. I have.

Q. 61. Would not such a pulley be more perfectly balanced than pulleys which are made after the Medart pulleys?

A. They would not. From personal observation I can state that. I have made pulleys that way. Being made with a center web of metal, the web shrinks fearful, and there would be blow-holes in the hob, whereas in this Medart pulley there is not the amount of metal to shrink and make that variation, always taking the sizes of the pulleys into consideration; by that, I mean the diameters and faces.

Q. 62. What difference would it make how much the metal shrank

in those cast-iron pulleys, so long as it was afterwards bored and turned perfectly true in all its parts?

A. From practical observation we find that metal shrinks in some places more than in others.

Q. 63. Well, if it shrinks more, or shrinks less, does that make any difference in the metal per square inch or cubic inch?

A. It does, assuredly.

Q. 64. Now, the defendants in this case use wrought-iron arms, do they not?

A. Yes, sir.

Q. 65. Then, so far as the arms are concerned, the defendants' pulleys do not change in weight by shrinking or irregular casting, do they?

A. They do change in weight, because they have a cast hub.

Q. 66. I am speaking of the arms and not of the hubs. Do
173 you mean to say that the wrought-iron arms of the defendants' pulleys change in weight by casting the hub?

A. No, sir; I don't mean to say that.

Q. 67. Well, then, do the arms of the defendants' pulleys change in weight on account of casting, as the arms do in the Medart pulleys?

A. They do not.

Q. 68. Then, so far as the variations which occur from casting are involved in the Medart pulleys, they are not as perfectly accurate, are they, as in the defendants' pulleys, where no such variations occur?

A. I don't mean to say that there are any variations occurring in the casting of them; I am simply speaking of the arms.

Q. 69. Do you think the specifications of that Medart patent, "Exhibit B," are correct or not, where it so repeatedly speaks of the irregularities which occur in the cast spider?

A. The specifications are correct.

Q. 70. Well, do those irregularities occur in the cast spiders?

A. They do.

Q. 71. Do a portion of those irregularities occur in the arms of the cast spider?

A. They do when a rim is attached to them.

Q. 72. What do you mean by the last answer?

A. When a cast rim is attached to those spiders then the irregularities are greater than they are without a cast rim being attached.

Q. 73. Those specifications of that patent, "Exhibit B," do not mention any cast rim, do they?

A. Yes; they do.

Q. 74. What do they say about a cast rim?

174 A. "Thus, while cast pulleys are of accurate shape they cannot be practically produced of perfect balance, owing to the irregularity of the weight of the metal at different portions of the rim and to contraction in cooling."

Q. 75. Do any portion of the irregularities occur in the arms of the

cast spider mentioned in the patent, "Exhibit B," when made for the Medart pulley?

A. They do.

Q. 76. Now, so long as irregularities do occur in the arms of the cast spider in the Medart pulley and none occur in the wrought-iron arms of the defendants' pulley, is not the defendants' pulley that much more nearly perfect than the Medart pulley in balance?

A. It is when you simply refer to the shrinkage in the two different metals.

Q. 77. That is, there is shrinkage in the arms of the Medart spider and no shrinkage in the arms of the defendants' spider; is that what you mean?

A. That is what I mean.

Q. 78. Then in the defendants' spider there is no need, is there, of providing any remedy for counterbalancing the irregular shrinkage of the arms—I mean the arms alone?

A. There is no need of overcoming any irregularity regarding the shrinkage of the arms in the arms of defendants' spider.

Re-examination of CONSTANT MEESE.

(By Mr. ECCLES:)

175 Q. 1. If you would take a piece of sheet metal, say eight inches wide and long enough to make a rim for a pulley two feet in diameter, and place a piece of iron between that piece of sheet metal longitudinal with it and between one of the rolls of an ordinary iron roll or a straight bonding roll, and put a pressure on sufficient to flatten out that piece of iron, would not the tendency be to spread the iron instead of lengthening it? In other words, wouldn't it spread and not lengthen at all?

A. It would spread and not lengthen at all.

Q. 2. State why it would do that.

A. Because the resistance is less on the sides, and it would naturally go to where it has the least resistance. I am talking about this thing practically and no- theoretically.

Q. 3. These slight irregularities of balance in manufacturing the Medart pulley occur more from want of care of the workmen than from any defect in the process, do they not?

(Question objected to by respondents as leading, and withdrawn.)

Q. 4. State what these slight irregularities in the balance of the pulleys manufactured by you are due to.

A. They are due generally to the carelessness of the moulders in not getting their hubs centrally on the spiders.

Q. 5. In the spider of the defendants' pulley which has the wrought-iron arms are not the arms lengthened or shortened in the casting of the spider by the shrinking of the hub, more or less?

A. They are, more or less.

Q. 6. So that when the hub shrinks in cooling, if one portion of the hub shrinks more than -other portion, that portion will

176 tend to shrink the arm of the spider at that point, would it not?

A. Yes, sir.

Q. 7. Where does the iron shrink the most—where it is heaviest or where it is lightest?

A. It shrinks most where it is heaviest.

(By Mr. WHEATON:)

Q. 8. What do you by "heaviest"?

A. Where there is the largest quantity of metal.

Q. 9. You don't mean the difference in weight?

A. No, sir; where there is the largest quantity of metal it will shrink.

(By Mr. ECCLES:)

Q. 10. State, then, whether the greatest irregularity from shrinkage in a cast-iron spider will occur in the hub or in the arms.

A. It will occur in the hub.

Deposition of Henry H. Lynch.

Examination-in-chief of HENRY H. LYNCH on behalf of complainants.

(By Mr. ECCLES:)

Q. 1. State your name, age, place of residence, and occupation.

A. My name is Henry H. Lynch; my age, thirty-nine years; I reside in San Francisco, and am by occupation the superintendent of the Powell Street railroad.

Q. 2. How long have you been a practical mechanic?

A. About twenty-five years.

Q. 3. What has been your experience in mechanics practically?

A. Well, I have been connected with building dredging ma-
177 chines, steamboats, hoisting works, mills, and street railways.

Q. 4. Have you or have you not been accustomed to constructing those things from specifications and drawings?

A. I have.

Q. 5. Have you read the English patent termed the Robert Mathers patent, a copy of which is before you, or that portion of it which refers to the construction of the rim of a pulley?

A. Yes, sir; I have.

Q. 6. Will you state whether by that specification a mechanic skilled in the art would construct a pulley by bending it into a circle first and then crowning it, or whether he would construct it by bending it into a circle and crowning it at one and the same time, following that specification?

Mr. WHEATON: That question is objected to because it is calling for a construction of the specification by the witness, which is a written document. The witness should state what he knows about the state of the art, and has no right to give a construction of a written document.

A. Well, to follow out this specification, as I can understand it by reading it, I should certainly think he was bending it into a circle first and afterwards running it through other rolls and crowning it.

Q. 7. In 1873 and prior thereto what was meant by the technical terms "bending rolls," if you know?

Mr. WHEATON: I object to that unless it is shown that the
178 witness knows what was meant at that time and what the expression was limited to.

A. Well, I was building boilers before that time, and "bending rolls" were for the purpose of bending iron to make boilers with into circles.

Cross-examination of HENRY H. LYNCH.

(By Mr. WHEATON:)

Q. 1. In the patent, "Exhibit C," in evidence, which was applied for November 27th, 1880, by the complainant, he speaks of "constructing the usual crown or dish on the rim of wrought-metal-rimmed pulleys by bending said rim transversely during the process of manufacture." Are you acquainted enough in the art of manufacturing pulleys to know at that time what the usual crown or dish on the rim of wrought-metal pulleys was?

A. No, sir.

Q. 2. Do you know how, prior to that time, that usual crown or dish was put on those rims during the process of manufacture?

A. Well, I had a pulley made in 1876 of wrought iron and a crown was put into it by hammering. It was an endless job to get it into any kind of shape, and it cost a great deal of money.

Q. 3. What did you do with that pulley?

A. We had it in a quartz mill at Virginia City.

Q. 4. Where was the pulley made?

A. It was made by—I think it was made by the Golden
179 State and Miners' iron works, in this city.

Q. 5. Did that pulley have arms in it?

A. Yes, sir.

Q. 6. What were they made of?

A. They were cast.

Q. 7. What was the size of the pulley?

A. Well, I think the pulley was about five feet in diameter.

Q. 8. Did you see that pulley when it was being made?

A. Well, I saw it after it was completed. I don't know whether I saw them making it or not.

Q. 9. Do you know how the ends of the arm were made concentric with the axis of the pulley?

A. No, sir.

Q. 10. Was the pulley round?

A. Yes, sir.

Q. 11. Did it run true enough to carry the belt, to do practical work?

A. Well, yes, sir; it did very good work.

Q. 12. How powerful a belt did you run on that pulley?
A. Well, about twenty-horse power, I think.
Q. 13. Then it was a very large and very strong pulley, was it?
A. Yes, sir.
Q. 14. Did it do good, practical work?
A. Yes, sir.
Q. 15. What difference did it make whether the crown was put on that pulley by bending rolls or by hammering it?
A. Well, I consider that it would have made a better job if it had been bent in rolls.
Q. 16. Suppose that one job was equally as good as the other, does it make any difference, then, to the pulley whether it was crowned in rolls or crowned by hammering?
180 A. I consider that if it was crowned by hammer it would certainly weaken the metal more than by rolling it.
Q. 17. Do you remember how that was, in fact?
A. Well, no more than it was not as smooth a job as you get now. You can buy a pulley now that is much better.
Q. 18. Do you know how the surface of that rim was finished—the rim of that pulley you had in 1876?
A. Well, it was just rough; just as the metal left it.
Q. 19. Did they use emery or files on it?
A. No, sir.
Q. 20. Was it put into a lathe or not?
A. No, sir.
Q. 21. Do you know whether it was or not?
A. Well, I am satisfied that the outside of the rim was not.
Q. 22. Do you know how it was?
A. Well, I am satisfied that the outside of the rim was not turned or finished up in any way.
Q. 23. How do you know, if you were not there when it was manufactured?
A. Well, I know that the rim of the pulley was not turned or the face of it. They might have put it into a lathe, but if they did they didn't face it.
Q. 24. What was the diameter of that pulley?
A. I think it was about five feet. I would not be positive, though, as to the diameter, because it was a good while ago.
Q. 25. Now, the patent, "Exhibit C," says: "The crown or dish *d* usual to belt-pulleys is formed on the rim by D bending or
181 dishing the rim during the process of manufacture." Do you understand that expression?
A. Well, I should understand that that was rolled that way.
Q. 26. Why would you understand it was rolled that way when it doesn't say a word about rolling?
A. Well, it says it was made that way in the process of manufacture.
Q. 27. Well, it uses the expression "bending or dishing." Do you understand that the word "bending" and the word "dishing" means one and the same thing there?
A. Yes, sir.

Q. 28. Have you any reason to suppose that the word "bending" in the Medart patent means anything different from the word bending in the Mathers patent?

A. No, sir; not as far as it goes.

Q. 29. Then, if "bending" means the same thing as "crowning" or "dishing" in the Medart patent, why wouldn't the word "bending" mean the same as "crowning" or "dishing" in the Mathers patent?

A. It would.

Q. 30. Now, in this part of the expression, which I will read to you, state whether there is anything that indicates whether the bending or dishing is put on by one set of rolls or whether it is first rolled straight in cross-section and then dished. The expression I refer to is as follows: "The crown or dish usual to belt pulleys is formed on the rim D by bending or dishing the rim during the process of manufacture."

A. Well, I should say that that was crowning it at the same time that you bent it into a circle.

182 Q. 31. Now, then, why wouldn't this expression in the Mathers patent also mean crowning it at the same time that it was bent into a circle: "The driving rims thus formed may be made flat or convex in cross-section by means of suitable rolls"?

A. Well, he starts in here first by saying that he bends it——

Q. 32. (Interrupting.) Well, leave that out. What is there in that expression I have read to you, taken by itself, that indicates that the rims are not thus formed convex in cross-section at the same time that they are rolled into a circle?

A. It says, "The driving rims thus formed may be made flat or convex." I can't understand how you want the question answered. He says here that "the driving rims thus formed," but first specifies how they are formed; and then it says that "the driving rims thus formed may be made flat or convex." Now, I don't know how I am going to answer it.

Q. 33. Well, to go back to the Medart patent, "Exhibit C," do you know what was meant by "the usual crown or dish on the rim, of wrought-metal-rimmed pulleys" there mentioned in November, 1880?

A. No, sir; I don't think that I did, at that time.

Q. 34. The specification says, "And this invention consists, first, in constructing the usual crown or dish on the rim of wrought-metal-rimmed pulleys by bending said rim transversely during the process of manufacture." Now, so long as the invention puts the usual crown or dish on the rim of wrought-metal pulleys,

183 does it make any difference in the pulley itself whether that ordinary, usual crown is put on by rolls or by bending during the process of manufacture or in any other way?

A. No, sir; it would not make any difference, provided they got them true, either way.

Q. 35. Well, so long as it says to use the ordinary crown, would it make any difference whether they were true or not?

A. Well the nearer true they were the better the pulley would be?

Q. 36. If they put on the ordinary, usual crown it would be as true in one case as the other, wouldn't it?

A. Well, it might be and it might not.

Q. 37. That is your understanding of language, is it, that although it would be the *the* same ordinary, usual crown that was put on pulleys, still it might be more true?

A. It might be more true in one case than the other. If it was exactly the same, they would be exactly alike all the time; there would not be any difference.

Q. 38. Did you ever see any pulleys ever used in which tests were made to ascertain the increasing velocity of falling bodies?

A. No, sir.

Q. 39. Do you know that such pulleys have been made, and made absolutely and perfectly true and accurate—that is, that every part of the surface of the rim was absolutely true with the axis of the pulley and it was also exactly balanced?

A. No, sir; I don't think they make any pulleys that would be absolutely balanced.

184 Q. 40. Then if such pulleys as that were used in philosophical apparatus you never saw any, did you?

A. Not that I know of. I never saw a pulley that was absolutely balanced that I know of.

(Testimony closed.)

185 *Certificate to Depositions.*

I certify that the foregoing depositions were taken at the place stated in the caption to said depositions, at the several times set forth in said depositions, in my presence and in the presence of counsel for the respective parties to the cause in said caption entitled; that previous to giving his testimony each of the witnesses in said depositions named was by me duly sworn to tell the truth, the whole truth, and nothing but the truth in said cause; that said depositions were, except in so far as they were taken down in writing by the examiner, taken down in short-hand writing and transcribed by A. L. Coombs, pursuant to stipulation and agreement of counsel; that said depositions, after being so transcribed, were read by or by me to the said witnesses and signed by them respectively, except in those cases where such reading and signing were by agreement of said counsel waived, as in said depositions set forth, and that I have retained said depositions for the purpose of delivering the same with my own hand to the court for which they were taken.

Accompanying said depositions and forming part thereof are the several exhibits introduced in connection therewith and referred to and specified therein.

I further certify that I am not attorney nor of counsel for any of the parties to said cause nor in any way interested in the event thereof.

U. S. Circuit Court, N. Dist. of Cal.

Medart

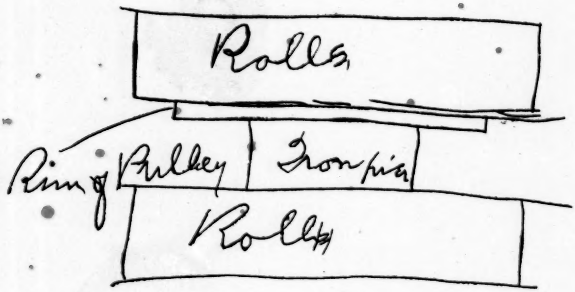
vs.

Fitchburg P. L. Works

No. 3805

Complainant's Exhibit Birch Draft

Examiner.



Complainants Exhibit Birch Draft"

Endorsed:- Opened and Re-filed August 7, 1889,

L. S. B. Sawyer, Clerk,

By F. D. Monckton,

Deputy Clerk.

7th day of

ON,
. of Cal.

1889. L.

ed p. 187.)

Our Price List is for Wrought Iron Rim Pulleys with face, with wrought iron arms, cast iron hubs bored to fit the s one or two set screws, if so ordered.

Tight and Loose Pulleys in pairs.....
For Pulleys with hubs made large and furnished with taper b
Pulleys made in halves.....
A moderate price will be charged for key-seating pulleys.
Pulleys over 13-inch face are furnished with two or more
Special prices given for pulleys over 25 inches face.

INSTRUCTIONS FOR ORDERING P

Examiner.

tendent.

Address all orders to RISDON IRON AND LOCOMOTIVE CISCO, CAL.

For a shifting belt the face of the pulley should be straig
For a belt that does not shift the face of the pulley shoul
Tight and Loose Pulleys should have crowning face.

0, 1888.

vorks, Dr.,
ndrymen,

... $5 10

Complainant's Exhibit "Circular."

EXAMPLES OF ORDER

RISDON IRON W

Number of Pulleys.....	Kind of Rim..	Diameter..	Width of Face.	Crowning or Straight.....	For Bore give us exact size of your shaft.	DESCRIPTION
1	Iron	36 inch	8 inch	Crowning	3 15/16 inch	Set Screwed...
1	Steel	36 "	8 "	Straight	3 15/16 "	" " ...
1	Iron	36 "	8 "	Crowning	3 15/16 "	Keyseated.....
1	Iron	36 "	8 "	Crowning	3½ "	Made in halves

ORKS,

3. Sawyer,

CONICAL WEDGE BUSHING

SAN FRANCISC

xaminer.

These Bushings are bored parallel to fit the shaft, and on the outside to fit a taper hole in the pulley. They obv. key ways and set screws and facilitate changing the positi shaft. We guarantee them to hold the pulley and transm the belt.

Our standard length for these bushings is 2½ times shaft; a small extra charge will be made when they are requi

A shaft will run more perfectly under a heavy belt s no keyways in it. When a pulley is to be moved it is simpl back the wedges and it is perfectly loose.

Engineers and mill men, who have had to move tight shaft that is dirty or bruised, will at once see the advantage o Bushings.

ttiswoode, hed at the orn, 1873.

Comp

Exh

Birch

In witness whereof I have hereunto set my hand this 7th day of August, A. D. 1889.

S. C. HOUGHTON,
Examiner in Chancery, U. S. Circuit Court, Dist. of Cal.

Endorsed: Testimony. Opened and refiled August 7, 1889. L. S. B. Sawyer, clerk, by F. D. Monckton, deputy clerk.

(Here follows diagram marked p. 186 and circular marked p. 187.)

188 U. S. Circuit Court, N. Dist. of Cal.

MEDART
vs.
RISDON I. & L. W'KS. } No. 3805.

COMPLAINANTS' EXHIBIT RESPONDENTS' BILL. S. C. H., Examiner.

W. H. Taylor, president. Robert S. Moore, superintendent.

The Risdon iron and locomotive works.

SAN FRANCISCO, *Jan'y* 30, 1888.

Mr. Geo. E. Randolph to the Risdon iron & locomotive works, Dr., steam-engine builders, boiler-makers, machinists, and foundrymen, corner of Beale and Howard streets.

5505. 1 McBeth pulley, 18 x 6 x $2\frac{3}{16}$ $5 10

Received paym't Jan. 30.

RISDON IRON WORKS,
Per T. TOMLINSON.

[Written across face in lead pencil:] C. B.

Endorsed: Opened and refiled August 7, 1889. L. S. B. Sawyer, clerk, by F. D. Monckton, deputy clerk.

189 & 189*a* U. S. Circuit Court, N. Dist. of Cal.

MEDART
vs.
RISDON IRON & L. WORKS. } No. 3805.

RESPONDENTS' EXHIBIT MATHERS PATENT. S. C. H., Examiner.

[British coat of arms.]

A. D. 1873, 12th June. No. 2081.

Specification of Robert Mathers.

Driving drums, &c.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal patent office, 25, Southampton buildings, Holborn, 1873. Price, 4d.
14—164

189*b* [British coat of arms.]

A. D. 1873, 12th June. No. 2081.

Driving Drums, &c.

Letters patent to Robert Mathers, of Leeds, in the county of York, engineer, for the invention of "improvements in the construction of driving drums, strap pulleys, or riggers."

Sealed the 9th December 1873, and dated the 12th June 1873.

Provisional specification left by the said Robert Mathers at the office of the commissioners of patents, with his petition, on the 12th June 1873.

I, Robert Mathers, of Leeds, in the county of York, engineer, do hereby declare the nature of my said invention for "improvements in the construction of driving drums, strap pulleys, or riggers" to be as follows:—

The objects of these improvements are economy in construction, strength, and lightness, a more certain balance of parts, facility of fixing and removing, and advantages in packing for railway conveyance or other transmission. For these purposes I employ or use a set of arms, boss, and narrow bearing rim, which may be whole or in halves. When in halves they are bolted or cottered together at the rim and boss in the usual well-known manner.

189*c* The driving surface or rim is formed of a separate band or strip of iron or steel of a suitable thickness, and of any breadth required, and may also be made flat or convex. This band or strip of iron or steel is made by bending so as to encircle or fit the bearing rim and arms, the two ends being fitted and joined by means of a butt plate and bolts, screws, or rivets, or in the manner of a clasp hoop with loops and cotters, or other convenient and suitable means, so that the same may be held firmly together.

Projections on the inner side of the driving rim, fitting into corresponding recesses in the periphery of the bearing rim, or countersunk screws or bolts may also be used to secure and retain the same when in position.

Specification in pursuance of the conditions of the letters patent, filed by the said Robert Mathers in the Great Seal patent office on the 11th December 1873.

To all to whom these presents shall come, I, Robert Mathers, of Leeds, in the county of York, engineer, send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the twelfth day of June, in the year of our Lord one thousand eight hundred and seventy-three, in the 36th year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Robert Mathers, her special license that I, the said Robert Mathers, my executors, administrators, and assigns, or such others as I, the said Robert Mathers, my executors, administrators, or assigns, should at any time agree with, and no others,

from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in the construction of driving drums, strap pulleys, or riggers," upon the condition (amongst others) that I, the said Robert Mathers, my executors or administrators, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed
189*d* in the Great Seal patent office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said Robert Mathers, do hereby declare the nature of my said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement, that is to say:—

My said invention has for its object improvements in the construction of driving drums, strap pulleys, or riggers, whereby greater facility is afforded for fixing and removal, and convenience of packing for transmission, combined with lightness, strength and a more even balance, and with economy in first cost. For these purposes in constructing drums, pulleys, or riggers, I employ or use a set of arms, boss, and narrow bearing rim, which may be whole or in halves. When in halves they are bolted or cottered together at the rim and boss in the usual well-known manner, the boss being bored to the size required, and the periphery of the narrow bearing rim being suitably turned to receive a sheet steel or iron cover forming the driving surface.

This driving surface or rim constitutes a separate band or strip of sheet iron or steel of a suitable thickness and of any breadth required, and is bent into form by passing it repeatedly through and between a pair of bending rolls of hard or chilled metal for the purpose of bringing it to the diameter required. The driving rims thus formed may be made flat or convex in cross-section by means of suitable rolls, the curvature and cold rolling greatly increasing the rigidity and improving the rim as a driving surface. The rim or cover is thus made to encircle or fit upon the turned periphery of the narrow bearing rim and arms, and has its two ends fitted and joined together by means of a butt plate or plates and bolts, or by screws or rivets, or in the manner of a clasp hoop, with loops and cotters, so that the same may be held firmly together.

Projections on the inner side of the driving rim, fitting into corresponding recesses in the periphery of the bearing rim or countersunk screws or bolts, may also be used to secure and retain the driving rim when in position.

When a great width of driving surface is required two or more bearing rims placed at suitable distances apart may be used for carrying and supporting any width of driving rim required, which is to be held in position and secured by the means and in the manner before described.

189*e* Having now described and particularly ascertained the nature of my said invention, and the manner in which the same is or may be used or carried into effect, I would observe in conclusion that what I consider to be novel and original and therefore claim as the invention secured to me by the hereinbefore in part recited letters patent is, the construction and use of driving drums, strap pulleys, or riggers having hard rolled sheet steel or iron driving rims or covers of a flat or curved transverse section fitted and fixed upon a bearing rim, arms, and boss, substantially as and for the purposes hereinbefore described.

In witness whereof, I, the said Robert Mathers, have to this my specification set my hand and seal, this ninth day of December, one thousand eight hundred and seventy-three.

ROBERT MATHERS. [L. S.]

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1873.

Endorsed: Opened and refiled August 7, 1889. L. S. B. Sawyer, clerk, by F. D. Monckton, deputy clerk.

190 & 190*a* U. S. Circuit Court, N. Dis. of Cal.

MEDART
vs.
RISDON I. & L. WORKS. } No. 3805.

RESPONDENTS' EXHIBIT GUBBINS PATENT. S. C. H., Examiner.

[British coat of arms.]

A. D. 1879, 1st November. No. 4465.

Specification of Richard Russell Gubbins.

Portable wheel.

Printed by order of the commissioners of patents for inventions. London: Published and sold at the commissioners of patents' sale department, 38, Cursitor street, Chancery lane E. C. 1880.
Price, 4d.

190*b* A. D. 1879, 1st November. No. 4465.

Portable Wheel.

Letters patent to Richard Russell Gubbins, civil engineer, of No. 17, Park road, New Cross, S. C., for the invention of "an improved portable wheel."

Sealed the 23rd April 1880, and dated the 1st November 1879.

Provisional specification left by the said Richard Russell Gubbins at the office of the commissioners of patents on the 1st November 1879.

Richard Russell Gubbins, civil engineer, of No. 17, Park road, New Cross, S. E. "An improved portable wheel."

My improved wheel may be used for any of the known mechanical purposes where portability is required, but preferably for cases where it is inconvenient to remove shafting or hangers for the purpose of replacing old wheels or adding new ones.

With the above object I make a smaller portion than half of the periphery of the wheel removable, together with one or more of the spokes or arms and a portion of the boss, sufficient to admit the shaft; the removable part may be then replaced & secured in its original position in the wheel.

[Price, 4d.]

190*c* Specification in pursuance of the conditions of the letters patent filed by the said Richard Russell Gubbins in the Great Seal patent office on the 1st May 1880.

Richard Russell Gubbins, civil engineer, of 17, Park road, New Cross, S. E. "An improved portable wheel."

My improved wheel may be used for any of the known mechanical purposes where portability is required, but preferably for cases where it is inconvenient to remove shafting or hangers for the purpose of replacing old wheels or adding new ones.

With the above object I make a smaller portion than half of the periphery of the wheel removable, together with one or more of the spokes or arms and a portion of the boss sufficient to admit the shaft; the removable part may then be replaced in its original position in the wheel.

But to make my invention better understood I will proceed to describe the same by reference to the accompanying drawing, in

(Here follows diagram marked p. 190*d*.)

which figure 1 is a perspective view of a wheel constructed according to my improvements, and figure 2 a similar view shewing the smaller portion of the wheel being placed in its original position on the wheel.

A is the wheel; B is the portion of the periphery thereof (less than one-half) which is removable, together with one of the arms or spokes C, and a portion D of the boss sufficient to admit the shaft; the two parts of the wheel may be secured together in any suitable manner, as, for example, the parts of the boss may be tongued and slotted, as shewn in the drawing, and pins or bolts *b*, *b*, passed through the holes *a*, *a*, and the parts of the periphery may be fixed together in the manner shewn in the drawing.

From this construction it will be seen that the wheel can be quickly and easily placed on or removed from a shaft or hanger without it being necessary to take down the shafting.

I am aware that it has been before proposed to employ split or divided pulleys or wheels made in halves, and also split pulleys in which the boss was in halves, but I lay no claim to either of these constructions, nor do I confine myself to the form of wheel shewn in the drawing, as the same may be varied without departing from the peculiar character of my invention; but what I claim is,—

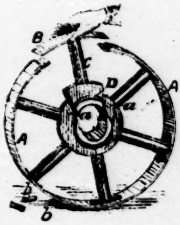
A portable wheel having a smaller portion than half the periphery thereof removable; together with one or more of the spokes or arms, and a portion of the boss sufficient to admit the shaft, substantially as and for the purpose hereinbefore described and represented in the accompanying drawing.

In witness whereof, I, the said Richard Russell Gubbins, have

A.D 1879. Nov. I. N° 4465.
GUBBIN'S SPECIFICATION

(1 SHEET)

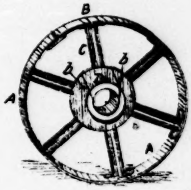
FIG. 2.



No. 16
R. S. H. Works } p. 190 d
v.
Midark

Respondent's
Exhibit
Gubbins Patent

FIG. 1.



Malby & Sons Photo-Lith.

London: Printed by George Edward Eyre and William Spottiswoode
Printers to the Queen's most Excellent Majesty. 1880.

Endorsed: Opened & Re-Filed August 7 1889
L. S. B SAWYER, Clerk

By J. D. Monckton
DEPUTY CLERK

hereto set my hand and seal, this first day of May, in the year of our Lord one thousand eight hundred and eighty.

R. R. GUBBINS. [L. S.]

Witness:
G. F. REDFERN,
4, *South Street, Finsbury, London.*

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's Most Excellent Majesty. For Her Majesty's stationary office. 1880.

191 At a stated term, to wit, the February term, A. D. 1891, of the circuit court of the United States of America of the ninth judicial circuit in and for the northern district of California, held at the court-room, in the city and county of San Francisco, on Thursday, the 12th day of March, in the year of our Lord one thousand eight hundred and ninety-one.

Present: The Honorable Thomas P. Hawley, United States district judge, district of Nevada.

Order Allowing Appeal.

PHILIP MEDART *et al.*
vs.
RISDON IRON AND LOCOMOTIVE WORKS *et al.* } No. 3805.

On motion of F. J. Kierce, Esq., of counsel for respondents, it is ordered that an appeal to the Supreme Court of the United States from the decree heretofore filed and entered herein as to said Risdon Iron and Locomotive Works be, and the same hereby is, allowed, and that a certified transcript of the record, testimony, exhibits, and all proceedings herein be forthwith transmitted to said Supreme Court.

It is further ordered that the amount of the bond on appeal be fixed at the sum of four thousand dollars.

192 *Bond on Appeal.*

In the Supreme Court of the United States.

RISDON IRON AND LOCOMOTIVE WORKS, Appellant,
vs.
PHILIP MEDART and WILLIAM MEDART, Appellees.

Know all men by these presents that we, L. R. Mead and Robert S. Moore, are held and firmly bound unto Philip Medart and William Medart, the above-named appellees, in the sum of four thousand dollars, lawful money of the United States of America, to be paid to the said Philip Medart and William Medart, their executors or administrators; to which payment, well and truly to be made, we bind ourselves and each of us, jointly and severally, and our and each of our heirs, executors, and administrators, firmly by these presents.

Dated this 19th day of March, A. D. 1891.

The condition of this obligation is such that whereas said Risdon Iron and Locomotive Works has taken an appeal to the Supreme Court of the United States to reverse the decree filed and entered by the circuit court of the United States of the ninth judicial circuit in and for the northern district of California in the suit entitled Philip Medart and William Medart, complainants, against Risdon Iron and Locomotive Works *et al.*, respondents, No. 3805; which said decree was filed and entered in said circuit court on the
193 6th day of March, 1891, being a day in the February term, A. D. 1891, of said circuit court:

Now, therefore, if the above-named Risdon Iron and Locomotive Works shall prosecute its said appeal to effect and answer all costs and damages if it shall fail to make good its plea, then this obligation shall be void; otherwise to remain in full force and effect.

L. R. MEAD.
ROBERT S. MOORE.

Signed, sealed, and delivered in the presence of—
F. D. MONCKTON,
Commissioner U. S. Circuit Court,
Northern District of California.

UNITED STATES OF AMERICA,
Northern District of California, } ss:

L. R. Mead and Robert S. Moore, being duly sworn, each for himself says that he is a householder within the northern district of California, and that he is worth the sum of four thousand dollars exclusive of property exempt from execution and over and above all his just debts and liabilities.

L. R. MEAD.
ROBERT S. MOORE.

Subscribed and sworn to before me this 19th day of March, A. D. 1891.

F. D. MONCKTON,
Commissioner U. S. Circuit Court,
Northern District of California.

Endorsed: The form of the within bond and the sufficiency of the sureties thereon are hereby approved. Lorenzo Sawyer, judge. Filed March 19th, 1891. L. S. B. Sawyer, clerk.

194 *Order Allowing Withdrawal of Original Exhibits.*

In the Circuit Court of the United States, Ninth Judicial Circuit, Northern District of California.

PHILIP MEDART *et al.*
vs.
RISDON IRON AND LOCOMOTIVE WORKS. } No. 3805.

Good cause appearing therefor, it is ordered that the original exhibits, "Complainants' Exhibit Respondents' Pulley," "Complain-

ants' Exhibit Meese Pulley," and "Respondents' Exhibit Clot & Meese Pulley," the same being three iron belt pulleys, heretofore filed herein, be allowed to be withdrawn from the files of this cause for the purpose of being transmitted to the Supreme Court of the United States as a part of the record upon appeal to said Supreme Court in the above-entitled cause, the said original exhibits to be delivered to Messrs. Wheaton, Kalloch & Kierce, solicitors for appellants herein, and to be returned to the files of this cause in this court upon the final determination of said appeal by the Supreme Court of the United States.

(Signed) HAWLEY, *Judge.*

Dated April 15, 1891.

Endorsed: Filed April 15, 1891. L. S. B. Sawyer, clerk, by F. D. Monckton, deputy clerk.

195 In the Circuit Court of the United States, Ninth Judicial Circuit, Northern District of California.

PHILIP MEDART and WILLIAM MEDART, Complainants,
vs.
RISDON IRON AND LOCOMOTIVE WORKS, Respondent. } No. 3805.

I, L. S. B. Sawyer, clerk of the circuit court of the United States of America of the ninth judicial circuit in and for the northern district of California, do hereby certify the foregoing one hundred and ninety-four written and printed pages, numbered from 1 to 194, to be a full, true, and correct copy of the record and all proceedings in the above and therein entitled cause (excepting therefrom the original exhibits, "Complainants' Exhibit Respondents' Pulley," "Complainants' Exhibit Meese Pulley," and "Respondents' Exhibit Clot and Meese Pulley," the same being three iron belt pulleys, and which originals are transmitted herewith), and that the same, together with said original exhibits, constitute the transcript of the record upon appeal to the Supreme Court of the United States.

Seal U. S. Circuit Court, Northern Dist. Cal.

In testimony whereof I have hereunto set my hand and affixed the seal of said circuit court this 16th day of April, A. D. 1891.

L. S. B. SAWYER,
Clerk U. S. Circuit Court, Ninth Judicial Circuit, Northern District of California.

196 UNITED STATES OF AMERICA, *ss:*

To Philip Medart and William Medart, Greeting:

You are hereby cited and admonished to be and appear at the Supreme Court of the United States, to be held at the city of Washington, in the District of Columbia, on the eighth day of June, A. D. 1891, pursuant to an order allowing an appeal from a decree filed and entered of record on the 6th day of March, A. D. 1891, in

the clerk's office of the circuit court of the United States of the ninth judicial circuit, northern district of California, in that certain cause wherein Risdon Iron and Locomotive Works, a corporation, is respondent and appellant, and you are complainants and appellees, to show cause, if any there be, why the decree in the said order allowing appeal mentioned should not be corrected and speedy justice should not be done to the parties in that behalf.

Witness the Honorable Thomas P. Hawley, United States district judge, district of Nevada, assigned to hold and holding circuit court of the United States for the ninth judicial circuit, northern district of California, this tenth day of April, A. D. 1891, and of the Independence of the United States the one hundred and fifteenth.

THOMAS P. HAWLEY,
U. S. District Judge, District of Nevada, Assigned to Hold and Holding Circuit Court of the United States for the Ninth Judicial Circuit, Northern District of California.

197 [Endorsed:] In the Supreme Court of the United States. Risdon Iron and Locomotive Works, appellant, *vs.* Philip Medart and William Medart, appellees. Citation. Filed April 13th, 1891. L. S. B. Sawyer, clerk U. S. cir. court, nor. dist. Cal.

Service of the within citation and receipt of a copy thereof is hereby admitted this 13th day of April, 1891.

WM. M. ECCLES AND
ASH & MATHEWS,
Solicitors for Complainants and Appellees.

Endorsed on cover: Case No. 14,641. N. California C. C. U. S. No. 164. The Risdon Iron and Locomotive Works, appellant, *vs.* Philip Medart and William Medart. Filed May 14, 1891.

No. 164.

IN THE SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1864.

THE RISDON IRON AND LOCOMOTIVE WORKS,
Appellant,
VS.
PHILIP MEDART AND WILLIAM MEDART,
Appellees.

BRIEF OF APPELLANT.

M. A. WHEATON,
F. J. KIERCE,
E. R. TAYLOR,
Counsel for Appellant.

[illegible]

IN THE SUPREME COURT

OF THE

UNITED STATES.

THE RISDON IRON AND LOCOMOTIVE WORKS,

APPELLANT,

vs.

PHILIP MEDART AND WILLIAM MEDART,

APPELLEES.

APPELLANT'S BRIEF.

This action was brought by the appellees against the Risdon Iron and Locomotive Works, a corporation, William H. Taylor and Joseph Moore. No decree was entered against either William H. Taylor or Joseph Moore, and they are not parties to this appeal.

The action is in equity and was brought for an alleged infringement of the following three United States Letters Patent, viz.:

Patent No. 248,599, bearing date October 25, 1881. This patent was attached to and made a part of the bill of complaint as Exhibit A, and was granted for an alleged improvement in the manufacture of Belt Pulleys.

Patent No. 248,598, bearing date October 25, 1881. This patent was attached to and made a part of the bill as Exhibit B, and was granted for an alleged improvement in Belt Pulleys.

Patent No. 238,702, bearing date March 8, 1881. This patent was attached to and made a part of the bill as Exhibit C, and was granted for an alleged improvement in Belt Pulleys.

The bill was filed August 3, 1885.

The defendants appeared and demurred to the bill October 9, 1885.

March 15, 1886, the demurrer of the defendants was overruled, and leave given to answer.

April 8, 1886, the defendants filed their answer, and a replication was filed April 29, 1886.

Testimony was taken in the case and on the 26th day of August, 1890, an interlocutory decree was made and entered in

the complainants favor and against the corporation, the Risdon Iron and Locomotive Works, in which decree it was adjudged that the said patents and each of them were valid and the said corporation had infringed the first, second and third claims of patent Exhibit A; also both of the two claims of patent Exhibit B, and also the first claim of patent Exhibit C.

The interlocutory decree contained the usual injunction clause, enjoining the said corporation from infringing upon the patents, and it referred the case to a Master to take an accounting. Instead of taking an accounting the parties agreed that the damages should be fixed, as though so adjudged, at the sum of $1,811.25.

Thereafter on the 6th day of March, 1891, a final decree was entered repeating the terms of the interlocutory decree and for the damages.

The questions raised upon this appeal are:

1. Did the Court err in overruling the defendants demurrer as to its allegations in regard to the patent Exhibit A?

2. Did the Court err in overruling the defendants demurrer to the allegations of the bill in regard to patent Exhibit B?

3. Did the Court err in overruling the defendants demurrer to the bill as to its allegations in regard to patent Exhibit C?

4. Did the Court err in holding and deciding that patent Exhibit A was a valid patent?

Did the Court err in holding and deciding that patent Exhibit B was a valid patent?

5. Did the Court err in holding and deciding that patent Exhibit C was a valid patent? These last three questions arise upon both the demurrer and the evidence.

6. Did the Court err in holding and deciding that the defendant, the Risdon Iron and Locomotive Works, had infringed the said patents and each and every one of them?

No point is made on this appeal as to the amount of damages assessed, as the amount was agreed to.

The appellant assigns as error upon this appeal the following:

1. That the Court erred in overruling the defendant's demurrer as to that part of the bill which purported to set out a cause of action founded upon an alleged infringement of said patent Exhibit A, and in not holding that said patent was void upon its face for the reason that it did not cover, or purport to cover, any patentable invention.

2. That the Court erred in overruling the said demurrer as to that part of the said bill which purported to set out a cause of action founded upon an alleged infringement of said patent Exhibit B, and in not deciding that said patent Exhibit B was

void upon its face for the reason that it did not cover, or purport to cover, any patentable invention.

3. That the Court erred in overruling the said demurrer as to that part of the said bill which purported to set out a cause of action founded upon an alleged infringement of the said patent Exhibit C, and in not holding that the said patent was void upon its face for the reason that it did not cover, or purport to cover, any patentable invention.

4. That the Court erred in deciding that the defendant had infringed the said patent Exhibit A.

5. That the Court erred in deciding that the said defendant had infringed said patent Exhibit B.

6. That the Court erred in deciding that the said defendant had infringed said patent Exhibit C.

Appellant particularly points out that the decree is erroneous in adjudging that said patents, or each, or either of them is valid, and also in adjudging that each or either of them was infringed by the appellant.

Argument upon the Appellant's Demurrer.

The demurrer is on pages seven and eight of the transcript. The several patents were made parts of the bill, and the demurrer in its several divisions rests upon the ground that each one of the patents is void upon its face for the reason that it does not cover any patentable invention.

First as to patent Exhibit A, No. 248,599.

Is Exhibit A a valid patent upon its face?

This is a patent for the mere *mechanical operations* performed in manufacturing complainants' pulleys. In the first column of his specifications the patentee says that his "invention consists in *an improved process of manufacture.*" The so-called *process*, as covered by the claims, consists of the following several steps and none others:

First.—Centering the pulley center or spider.

Second.—Grinding the ends of the arms thereof concentrically with the axis of the pulley.

Third.—Boring the center.

Fourth.—Securing the rim to the spider.

Fifth.—Grinding the face of the rim concentric with the axis of the pulley.

Sixth.—Grinding or squaring the edges of the rim.

The foregoing are all the different steps that are set forth in the first three claims of the patent. The words "center" and "spider" mean one and the same thing.

The fourth claim of the patent is for centering the pulley center or spider upon a chuck or mandril, and then subjecting it to the various operations in the process of manufacture without removing it therefrom. This includes all of the several steps of the "process" which are covered by the other three claims.

See Record, pages 25 to 27.

It will be noticed that this patent does not cover any mechanism whatever. It is not a mechanical patent, but a *process* patent only.

Our contention is that the patent covers, as a process, *nothing but the functional performances of mechanism*, and that this is not a patentable subject matter, even though the mechanism which performed the functions might be entirely new and itself patentable, and the functions themselves never before performed for the reason that no machinery had ever before been made which would perform those functions. None of the mechanism however was new with the patentees.

In section 3 of Walker on Patents, the author very happily illustrates the difference between processes that are patentable and those that are not. He cites as one instance of a patentable process, "the mixing of crude India Rubber with sulphur, and then subjecting the mixture to a high degree of heat, thereby producing a new and useful composition of matter." Another process which he cites, that is *not* patentable, is that of the planing of boards by a planing machine. He says that the latter is not patentable, because it produces its result solely by the motions of a machine and upon purely mechanical principles. According to this section of Walker, the use of purely mechanical means to produce solely *a mechanical result* by the action of a machine operating upon mechanical principles only, is not a process that can be patented; but in order to be patentable there must be an operation performed which includes something that is not purely mechanical. He describes a patentable process as an operation provided by rule to produce a result.

See also section 4 and those following it in Walker on Patents, also:

Mac Kay vs. *Jackman*, 12 Fed. Rep., 615.
Hatch vs. *Moffitt*, 15 Fed. Rep., 252.
Dyfoos vs. *Wiese*, 19 *Ib.*, 316.
Gage vs. *Kellogg*, 23 *Ib.*, 891.
Reay vs. *Reanor*, 19 *Ib.*, 310.
Brainard vs. *Cramme*, 12 *Ib.*, 621.
Goss vs. *Cameron*, 14 *Ib.*, 576.

New vs. *Warren*, 22 O. G., 587.
Corning vs. *Burden*, 15 Howard, 252.
Burr vs. *Duryee*, 1 Wallace, last half of pages 569 and 570.

See also Robinson on Patents, sections 146 to 148 and 159, with the notes and references thereunder.
Cochrane vs. *Deener*, 94 U. S., 780, page 788.
Fond du Lac County vs. *May*, 137 U. S., 395, page 407.

In *Corning* vs. *Burden*, 15 Howard, pages 267 and 268, this Court in illustrating what is, and what is not a patentable process, says:

"A process, *eo nominee*, is not made the subject of a patent "in our Act of Congress. It is included under the general "term 'useful art.' An art may require one or more processes, "or machines, in order to produce a certain result or manufac- "ture. The term machine includes every mechanical device "or combination of mechanical powers and devices, to perform "some function and produce a certain effect or result. But "where the result or effect is produced by chemical action, by "the operation or application of some element or power of "nature, or of one substance to another, such modes, methods, "or operations, are called processes. A new process is usually "the result of discovery; a machine of invention."

* * * * * * * *

"But the term process is often used in a more vague sense, "in which it cannot be the subject of a patent. Thus we say "that a board is undergoing the process of being planed, grain "of being ground, iron of being hammered, or rolled. Here "the term is used subjunctively or passively as applied to the "material operated on, and not to the method or mode of pro- "ducing that operation, which is by mechanical means, or the "use of a machine, as distinguished from a process. In this "use of the term it represents the function of a machine, or "the effect produced by it on the material subjected to the "action of the machine. But it is well settled that a man can- "not have a patent for the function or abstract effect of a "machine, but only for the machine which produces it."

In this patent, Exhibit A, the only things described are mechanism and the effects produced by that mechanism in operating upon metal which is undergoing the process of being manufactured into pulleys. There is no effect, however, produced by chemical action, or by the operation or application of

any element or power of nature, or by the application of one substance to another. Nothing is covered by the claims of this patent except the functional operations of machinery, and the subject matter of the claims falls within the unpatentable matter of the authorities.

Not only is the patent void because of its being granted for an unpatentable subject matter, but it is also void, as we claim, for the reason that it does not cover or purport to cover anything that is new or novel in the manufacture of belt pulleys, or anything except what had been in common use from time immemorial, and was already well known to the world long before the patentee was born.

The Testimony.

Instead of pursuing our argument on the demurrer we will here refer to the testimony. The basis of the demurrer is that the patents are void upon their faces. If there is any doubt of this being so it will be of some advantage to have the testimony considered by the Court while it is considering the validity of the patents, as the testimony furnishes facts which go far towards showing actual anticipation of the alleged inventions, as well as the state of the art at the time the alleged inventions were made by the patentee, and therefore relieves the Court of deciding how far it will go in taking judicial notice of such state of the art, and enables it to make its decision upon facts proved instead of making it entirely upon facts of which it might take judicial notice. We claim that the patents are invalid for the reason that they do not cover any patentable invention, and the testimony assists in showing this.

The answer sets up as matters in anticipation an ancient English patent granted to Robert Mathers in 1873. Also an English patent granted to Richard Russell Gubbins in 1879. Also a prior manufacture, use and knowledge of the inventions at the Vulcan Iron Works in San Francisco by Joseph Moore, George Gordon, E. T. Steen and William H. Birch. See Record, page 11.

The evidence is in proof of the matters so set up.

The first testimony—the deposition of Philip Medart—is in the printed record from pages 33 to 37. He was called by the complainants. Mr. Medart simply testified to having seen a pulley purchased from the defendant by Clot & Meese in San Francisco. This was for the purpose of showing what kind of pulleys the defendant was making. He describes this pulley and gives it as his opinion that it was made after the same process as that by which his own pulleys were made. He also states

that the advantages of casting the spider without the rim, then grinding the ends off of the arms concentrically with the axis, then attaching the rim and grinding, are to get a light, strong and well-balanced pulley. That the pulley of the defendant contained those advantages, that the rim being made convex on one side and concave on the other, could be made much thinner and with the same strength, and contain less material than if it was not made concave on the inside and convex on the outside. That the complainants had sold about 200,000 pulleys in six or seven years. He also explains the unequal shrinking of the arms when the spider is cast, and consequent necessity of cutting off the ends of the arms to make them concentric with the pulley axis. That his experiments made with cast iron spiders and a wrought iron rim, without grinding the arms concentrically with the axis resulted in a failure to make a merchantable and practical pulley. That complainants had expended at least $30,000 in advertising and putting their pulleys before the people, and that the price of pulleys had been reduced fully one-half since the complainants put theirs upon the market.

This witness also testified that the arms of the spider of the defendants' pulley, which he saw in San Francisco, was *of wrought iron* instead of being cast.

The next witness called for the complainant was Constant Meese, who testified that he was a licensee in San Francisco under the complainant's patents. He introduced in evidence a circular issued by the defendants, which described the pulley made by the defendants and which was claimed to be an infringement. This was marked "Exhibit Circular," and is in the record between pages 104 and 105.

This witness also introduced in evidence one of the pulleys made by the defendant, together with the bill therefor, which bill was marked "Exhibit Bill," and is on page 105 of the record.

The witness was a member of the firm of Clot & Meese, and gave it as his opinion that the ends of the arms on the defendants pulley were ground concentrically with the center before attaching the rim thereto. Also that in his opinion the rim in that pulley was crowned and bent into a circle before attaching it to the arms. Upon cross-examination, witness testified that the *defendants had never made any pulleys with wooden arms*, so far as he knew. That he did not know how wrought metal rim pulleys were manufactured prior to the year 1880.

He further testified, page 45, Q. 10, also page 50, that *it made no difference when the pulley was finished whether the ends of the*

arms were made concentric with the center of the pulley by grinding, or whether they were made concentric by any other method such as turning or filing. That in either case *the pulley would be of the same value.* That well-known methods of shaping iron long prior to 1880 were by turning, planing, filing and chipping with a coal chisel. That he had seen them ground into shape ever since he was a boy. Also that grindstones for grinding metal were common implements with almost every farmer throughout the United States, as well as with every mechanic, and that the grinding of metal always changes its shape.

The defendants introduced in evidence a copy of English Letters Patent No. 2,081, granted June 12, 1873, to Robert Mathers for "Improvements in the Construction of Driving Drums, Strap Pulleys or Ribbons." Record, page 43. This was marked "Respondents' Exhibit Mather Patent." This patent is on pages 105, 106, 107 and 108 of the printed record.

The defendants also, at the same time, introduced in evidence a copy of English Patent No. 4,465, granted November 1, 1879, to Richard Russel Gubbins, for an "Improved Portable Wheel." This was marked "Respondents' Exhibit Gubbins Patent," and is in the printed record from pages 109 to 111. The evidence of Mr. Meese is in the record from pages 39 to 44.

The next witness was Wm. H. Birch, whose testimony is in the record from pages 44 to 75. He was called by the respondent.

This witness testified that he was the proprietor of the California Machine Works in San Francisco, and had been a practical machinist for over forty years. That he had known of belt pulleys being manufactured with wrought iron rims in 1853 while he was employed at the Vulcan Iron Works. That at the Vulcan Iron Works they made such pulleys at different times from 1852 to 1856. They made them that way for certain sizes of pulleys that they had no patterns to cast them from. In those pulleys the spiders were cast and were bolted on to the face plate of a large lathe and the ends of the spider arms were turned off, then the center was bored without moving the spider at all. Then the rims were rolled up in the boiler shop and fitted and rivited to the spider. The pulleys varied in size and were from five to six feet in diameter and with faces from eight to fifteen or eighteen inches. That that method of turning off the ends of the arms and boring out the center made the ends of the arms perfectly concentric with the center of the axis of the spider. The work so done was more likely to be true than if the ends of the arms had been ground off, for the reason that if they were ground they had to go to another ma-

chine, while when they were turned and bored on the same face plate and without being moved to any other machine they had to be perfectly true.

This witness also describes how they made the rims slightly concave on the inside and convex on the outside while rolling them. Record, 45 and 46.

That those rims were made just as described in complainant's patent Exhibit C, page 46.

This witness also compares the patent Exhibit C, with the prior English patent to Mathers, and says that in both instances the process and means by which the rims were formed as described in the two patents were the same. Pages 47 and 48.

He also mentions the fact that in the defendants' pulleys there are no cross-lugs on the ends of the spider arms. Page 48.

He also explains the unequal shrinkage that occurs with cast pulley arms, and explains that this does not occur with wrought arms. Pages 49, 50.

Also that it makes no difference in the pulley itself whether the arms are made concentric by turning or by grinding or by any of the other methods which he mentions on page 50.

He also explains the long and well-known use of grinding instead of turning in those cases in which the metal is too hard to be easily turned in a lathe.

He also testifies to the manufacture in or about the year 1860 of certain rolls for the United States Mint in San Francisco, in which the journals and faces of the rolls were ground, and also of the machine that was made to do that grinding with. Pages 51, 52, and again on cross-examination from page 55 to page 59.

That same identical grinding machine, which they had about the year 1860, is still in use at the U. S. Mint for grinding rolls. Page 56.

He also explains that as the arms of a cast spider will shrink unequally that some of the lugs must be ground off more than others. This will leave some of the lugs with more metal in them than there will be in those that are ground off the most and consequently *the balance of the pulley is not preserved when the concentric condition is obtained.* Pages 53 and 54.

This witness also testifies to the manufacture at the Vulcan Iron Works in San Francisco about 1864 of other pulleys with wrought iron metal rims, in which the arms were made of gas-pipe and the centers were cast. They were large pulleys and went to Mexico. Pages 54 and 55.

The cross-examination of this witness was continued from

page 55 to page 74, and in this he repeats the substance of his direct testimony and gives additional particulars in regard thereto.

The next witness was E. T. Steen, and he was also called for the respondent.

His testimony is in the record from page 75 to page 88. He testifies that he has been a practical machinist for forty-four years, and that he has known the Medart pulleys ever since the complainant's licensees—Clot & Meese—have been making them; he judges it to be six or seven years.

About the year 1853 he was one of the proprietors of the Vulcan Iron Works in San Francisco, and he testifies to the manufacture by said works of substantially the same kind of pulleys as those to which Mr. Birch had testified. Pages 76 and 77. He also testifies to the grinding of the faces of belt-pulleys by Jenks at Bridesburg, about eight miles from Philadelphia, in 1847. Page 77.

Also, that the grinding of belt-pulleys when they were too hard to turn was very common.

Also, that when the pulley was finished it made no difference in the pulley whether the ends of the arms had been made concentric by grinding or by any other means. Page 77. He also compares the description of complainant's patent, Exhibit C, with prior English Mathers patent, and says that the descriptions are substantially the same. Pages 77 and 78.

On his cross-examination, from page 79 to page 88, he adheres to what he testifies to in his direct examination.

On page 84 he testifies that it only requires a sufficient crown on a pulley to keep the belt on the pulley. That the belt will always run to the highest point.

On page 86 the parties admitted that the pulley, "Respondents' Exhibit Clot & Meese pulley," was one of those that was made under one of the patents sued on in this case by Clot & Meese, the complainant's licensees.

The witness—Steen—testified that this pulley was not perfectly balanced, and showed that, by actual tests made, it was two and a half ounces heavier on one side than it was on the other. Still it was well enough balanced for practical purposes. Pages 86 to 87 and 88. On pages 86 and 87 he testifies to what, as a mechanic, he understands the language of the English Mathers patent to mean.

Mr. Meese was recalled on behalf of the complainants. Record, pages 89 to 100. He testified that in his judgment a person would not make the crown on the pulley at the same time that he bent it into a circle under the English Mathers Patent.

That the defendant began making their pulleys after Clot & Meese began making the Medart pulleys. He also tells what he understands was meant by "bending rolls" in the art in 1873. That a pulley in which the weight on one side was only two and a half ounces heavier than it was on the other side would be considered in the trade ordinarily a perfectly balanced pulley. Also that a pulley, which was introduced in evidence and marked "Complainants' Meese Pulley," was made by him, and that their pulleys were generally more perfectly balanced than one having two and a half ounces more weight on one side than it had on the other. Also that they rolled the rims in setts of rolls in which the lower rolls were concave and the upper rolls were convex and thus formed the rim, making it convex on one side and concave on the other at one and the same time.

On cross-examination Mr. Meese admitted that he had never known crowned rims, or anything similar to crowned rims, to be run through rolls which first bent them into a circle leaving them straight in cross section and afterwards to be run through other rolls which crowned them. That he could not explain why he thought the Mathers English patent described such method. Also that a pulley rim was one and the same thing when it was finished, whether it was first rolled into a circle with a face straight in cross section and afterwards rolled in crowning rolls, or whether it was rolled and crowned at one and the same time. Record, pages 93 and 94. On pages from 96 to 99 the witness explains about the unequal shrinkage of cast spiders and the effect thereof; states that there is no such thing in practice as a perfectly balanced pulley, and also states that the *effects of the shrinkage of the cast arms do not occur in the defendants' pulleys because they are of wrought iron and do not do any shrinking.*

Complainants next called Henry H. Lynch as a witness. His testimony is in the record from page 101 to page 104. He was sworn merely as an expert to give an interpretation to the English Mathers patent; and he gives it as his opinion that a mechanic under that patent would first roll the pulley rim into a circle and crown it afterwards. On cross-examination, however, he testifies that in 1876 he had a wrought iron pulley made for a quartz mill in Virginia City. The pulley was about five feet in diameter and had cast arms. The pulley was round and did good, practical work. It was a very large and strong pulley and did good work running a belt with about twenty horse-power. A crown was put on it by hammering. He also testifies that it makes no difference in the pulley itself whether

the crown is put on one way or another. Page 103, near the bottom. That he never saw a pulley that was absolutely balanced. This closed the testimony.

Patent No. 238,702, which is Exhibit C of the Complainants' Bill.

We will present Exhibit C of the bill in advance of presenting Exhibit B, for the reason that Exhibit C was applied for and granted long before Exhibit B was applied for, and therefore its consideration naturally comes first.

Patent Exhibit C is a patent for an invention that is entirely by itself, and is separate and distinct from any invention described or claimed in either of the other patents. The patent is for a belt-pulley made with a *cast iron hub*, around the middle of which are six radial bosses, placed there to furnish sockets for the inner ends of a *set of wooden arms*. The pulley has wooden arms, the inner ends of which are fixed in sockets in the bosses mentioned, and on their outer ends are bracket-lugs that extend crosswise with the rim. It has a rim D, which the patent says, "may be of any suitable metal—either wrought iron, steel, *or wood*," etc.

There are two figures in the drawings, and they show a rim made in cross-section with a prodigious crown.

The cross-section of the rim, according to the drawings, is upon a curve having about a three-inch radius. If a pulley were constructed six inches in diameter, with the rim made as crowning as that shown in figure 2 of the drawings, and such rim were made ten inches wide, the whole pulley would become a sphere and perfectly round in every direction. Such crowns are never used in practice.

It is not pretended that either the defendants or complainants have ever made pulleys as described in this patent. The defendants certainly have not. There does not appear to be any pulleys on the market made with metal hubs and *wooden arms*, and there are certainly no pulleys, so far as the evidence shows, made *with any such amount of crown* in the rim as is shown in this patent. The pulley described in this patent seems to be less desirable than the ordinary pulleys, and is therefore of no pecuniary value. While it is not absolutely useless in a legal sense, it is so much inferior to other pulleys as to be worthless for practical purposes.

We both attack the validity of Exhibit C, and also deny that we have infringed it. There are two claims to the patent, the *second* one of which is for:

"A belt-pulley provided with *wooden* arms B, a cast-metal "hub A, having radial sockets *a* and bracket-lugs C, for the

" attachment of the rim D, as described, and for the purpose " set forth."

It is not claimed or decreed that the defendant ever made any pulley with wooden arms, or that it ever infringed this second claim. So nothing further need be said in regard to this second claim. It is the *first claim only* that has been adjudged to be infringed. See Record, last part of page 18 and first part of page 19.

The first claim of this patent, the one adjudged to be infringed, is for:

" A wrought metal-rimmed pulley, having a crown, *d*, formed " on its rim during the process of manufacture, as described, " and for the purpose set forth."

This first claim we believe to be entirely invalid, and that it is shown to be invalid both by the specifications of the patent, by the evidence in the case, and, we think we may add, by the common knowledge of the Court. As this patent has so far been treated as the most important factor in the suit, and as the whole text of its specifications is so short, we print the whole of it, and in so printing it, we put in italics all that portion of it which contains any description of the crown or dish on the pulley, or the means by which they are put there. It is as follows, viz.:

" To all whom it may concern:

" Be it known that I, Philip Medart, a citizen of the United " States, residing at St. Louis, State of Missouri, have invented " certain new and useful improvements in belt-pulleys; and I " do hereby declare that the following is a full, clear and exact " description of the invention, reference being had to the ac- " companying drawings, and to letters of reference marked " thereon, forming a part of this specification, in which Fig- " ure 1 is a perspective view, and Fig. 2 is a vertical section.

" This invention relates to certain inprovements in belt- " pulleys, and has for its object, first, the production of a cheap, " light and durable pulley; and, secondly, the production of " irregular sizes of pulleys without the necessity of a separate " pattern for each size of pulley required; *and this invention* " *consists, first, in constructing the usual crown or dish on the rim* " *of wrought metal-rimmed pulleys by bending said rim trans-* " *versely during the process of manufacture;* secondly, the belt- " pulley having arms formed of wood, preferably of a cylin- " drical shape, which at their inner ends rest in sockets cast on " the hub, and at their outer ends are provided with bracket- " lugs, to which the pin is secured by rivets or other equivalent " means.

" To enable others skilled in the art, to which my invention " appertains to make and use the same, I will now proceed to " more fully describe the same.

" A is the hub of the pulley, cast with radial sockets, *a*, to " receive the inner ends of the wooden arms B, of the pulley. " The recesses in these sockets are preferably of a cone shape, " and the ends of the arms are correspondingly shaped so as to " fit the same and have a firm and strong bearing.

" C are bracket-lugs attached to the outer ends of the arms " B, and provided with rivet-holes for the passage of rivets, by " means of which the rim D, of the pulley is secured in place. " The part of the arms B, that enters the bracket-lugs is pre- " ferably reduced in size so as to form a shoulder, *b*, on which " the lug rests, as clearly indicated in Fig. 2.

" The rim, D, may be of any suitable material—either wrought " iron, steel or wood—with the bracket-lugs, C, arranged trans- " versely as shown in order to brace and support the edges of " the rim and prevent the same fron working loose from its at- " tachment, which is liable to occur when the bracket-lugs are " not arranged as above set forth.

" *The crown or dish, d, usual to belt-pulleys, is formed on the " rim D by bending or dishing the rim during the process of " manufacture, preferably at the same time and by means of the " same rolls that bend the rim into the required circular shape.*

" By the use of wood for forming the arms of the pulley as " above set forth, a much lighter and cheaper pulley can be " produced than where iron is used for said arms, and yet pos- " sess as great strength.

" Having thus fully described my said invention, what I " claim as new, and desire to secure by letters patent, is—

" 1. *A wrought metal-rimmed pulley having a crown, d, formed " on its rim during the process of manufacture as described, and " for the purpose set forth.*

" 2. A belt-pulley provided with wooden arms B, a cast- " metal hub A, having radial sockets *a*, and bracket-lugs C, for " the attachment of the rim D, as described, and for the pur- " pose set forth.

" PHILIP MEDART.

" In presence of—
" WM. MEDART,
" ROBERT BURNS."

The defendants manufacture pulleys with a very slight crown on the rims amounting to only one-sixteenth of an inch crown on a rim that is over ten inches wide, and with *wrought iron arms* Record, page 74, beginning with Q. 231.

It is claimed that the defendants' pulleys infringe this patent, Exhibit C; *solely and only because of the slight crown which is put upon the rim.* The only feature of this patent, therefore, that requires any discussion *is the slight crown upon the rim of the pulley.*

Everything that is contained in the patent in the way of description which refers to the crown or dish on the rim of the pulley is covered by the foregoing portions of the specifications which are put in italics, leaving out the drawings and the declaration at the commencement of the specifications, which says that the patentee has invented certain new and useful improvements in belt-pulleys. The patent describes this crown or dish as the crown or dish "*usual to belt-pulleys*, and we ask in all conscience, what is there in the foregoing description of the *usual* crown or dish that is patentable? We will again print this portion of the patent which contains all that there is descriptive of the crown or dish, by itself, the better to see of what it consists; it is as follows: "*and this invention consists,* "*first, in constructing the* USUAL *crown or dish on the rim of the* "*wrought metal rimmed pulleys by bending said rim transversely* "*during the process of manufacture.*"

"The rim D, may be of any suitable material, either wrought "iron, steel, *or wood.*

"*The crown or dish, d,* USUAL TO BELT-PULLEYS, *is formed on* "*the rim D, by bending or dishing the rim during the process of* "*manufacture, preferably at the same time and by means of the* "*same rolls that bend the rim into the required circular shape.*"

The foregoing is absolutely all there is in the patent, except the drawings, prior to the claim with reference to the crown or dish upon the pulley. To find anything new in this description there must be taken from it what is old. The old includes the statement to the effect that the invention consists in constructing the USUAL CROWN OR DISH on the rim of wrought metal-rimmed pulleys *during the process of manufacture.* Forming the crown or dish on the rim is a *part of the manufacture itself,* and when the patentee states that he forms the *usual* crown or dish during the process of manufacture, he only states what obviously *must always have been done.* No crown or dish ever could have been put upon the rim of the pulley *except during the process of manufacture of that rim.* It is *a part of the process of manufacture,* and if it could be put upon the pulley at any other time than during the process of manufacture, then the whole entire pulley could be made at other times than during the process of its manufacture. This declaration occurs twice in the quotations above made, and when they are taken

out of the description there is nothing left that is new, or that purports to be new or novel in the patent. The whole description amounts to simply saying this:

"The rim D may be of any suitable material, either wrought "iron, steel, *or* wood. The crown or dish *d*, *usual to belt-* "*pulleys*, is formed on the rim by bending or dishing it during "the process of manufacture, preferably at the same time and "by means of the same rolls that bend the rim into the re- "quired circular shape."

By reading this description of the asserted invention in subdivisions the entire absence of novelty in anything that appears in the description is made even more apparent. We will present it in such divided form, viz.:

First. "The rim D may be of *any suitable* material, either wrought iron, steel or wood."

As belt-pulleys had from time immemorial been made of suitable material, including the three materials named, "wrought iron, steel and wood," as well as cast iron and brass, there was nothing that was new or novel in naming the materials of which the rims of the pulleys could be made.

Second. "The crown or dish, *usual to belt-pulleys*, is formed on the rim by bending or dishing it *during the process of manufacture*."

As this crown or dish is described in the patent as being the crown or dish that is *usual* to belt-pulleys there can be nothing novel in such crown or dish. If a defendant should put any dish or crown on the pulleys *which was not usual* to belt-pulleys he would not come within the description of the patent, and, of course, would not infringe it. If he put on the rim *only the usual crown* this could not be covered by the patent claim for want of novelty. Neither does the patent purport to cover it unless it is put on during the process of manufacture.

To this there are two answers, the first being that the *usual* crown or dish must always have been put on during the process of manufacture, since putting that crown or dish on the rim was part and parcel of the manufacture, or, if the opposite is true and it was possible to put the crown or dish on the rim at any other time than during the process of manufacture, then there was no actual proof of infringement, since the defendant was not shown to have put the crown or dish on its pulleys during the process of manufacture. For the purpose of showing infringement the complainants assume that the crown must have been put on during the process of manufacture for the reason that it could not have been put on at any other time, but in their efforts to sustain their patent they wish

the Court *to assume*, as the Circuit Court did assume, that such crown could have been put on at some other time than during the process of manufacture. We complain of this contradiction of assumptions. If the Court had a right to assume that the crown could have been put upon the rim at any time other than during the process of its manufacture, then it should have required *pooof* that the defendant did put the crown on during such process, instead of assuming it. The burden of proof in showing that there was an infringement is upon the complainant in any patent case.

Third. " Preferably at the same time and by means of the same rolls that bend the rim into the required shape."

Complainants contend that the expression " preferably at the same time and by means of the same rolls that bend the rim into the required circular shape," includes a description that covers something which is patentable. In this we contend they are mistaken for several reasons. In the first place, it is a mere expression of a preference of the time and means employed, and this Court has declared that the mere expression of a preference in this manner is no part of the patent.

In the case of *Sewall* vs. *Jones*, 1 Otto, 171, this Court says:

" Farther on the patentee, Winslow, says: 'I recommend " the following method.' *This is not of the substance of the " patent. A recommendation is quite different from a require- " ment.* The latter is a demand, an essential, a necessity. The former is a choice or preference between different modes or " subjects, *and is left to the pleasure or the judgment of the oper- " ator.* He may adopt it. He will do well if he does. But " he may reject it, and still accomplish his object by means of " the patent.

" The principle is this: The omission to mention in the " specification something which contributes only to the degree " of benefit, providing the apparatus would work beneficially " and be worth adopting without it, is not fatal; while the " omission of what is known to be necessary to the enjoyment " of the invention is fatal. (Curtis, Sec. 248.)

" An excess of description does not injure the patent, unless " the addition be fraudulent. (*Id.*, Sec. 250.)

" *Accordingly when the inventor says, 'I recommend the follow- " ing method,' he does not thereby constitute such method a portion " of his patent.* His patent may be infringed, although the " party does not follow his recommendation, but accomplishes " the same end by another method."

In the next place it is a mere statement of the time and means and by which the crowning and dishing is effected.

Neither the time, which is during the process of manufacture and while the rims are being rolled, *nor the means*, which are the rolls which do the bending, are covered by the claims of the patent. *These times and means are no part of what is patented, and no part of what purports to be patented.* Even if the patent had declared directly that the invention consisted of bending and dishing the rim at the same time, and by means of the same rolls that bend the rim into the required circular shape, *such invention would not constitute anything that is claimed in the patent.* The claim of the patent is for "*a wrought metal-rimmed pulley, having a crown, d, formed on its rim during the process of manufacture*, as described, and for the purpose set forth."

The claim is for the *pulley itself*, and it is not for the process of its manufacture, nor for the means by which it is made. The claim says nothing about the rolls or means. The claim is, we think, entirely without meaning. The words "during the process of manufacture" in the claim, seem to imply that the crown might be formed on the rim at some other time than during the process of manufacture, which, we think, is a self-evident impossibility, and consequently the impression conveyed by the use of the words mentioned is without any meaning.

Also the words "as described" in the claim, are without meaning, especially if they refer to the manner in which the crown, *d*, is formed on the rim, because the patent *does not anywhere describe the manner in which the crown is formed on the rim.* It tells *when* it is formed, which is during the process of manufacture; and expresses a preference that it shall be formed *by the use of rolls*, but *how it is formed* is not described.

Also the words in the claim "and for the *purpose* set forth," are entirely without any meaning since there is *no purpose set forth in the patent.* The patent nowhere undertakes to say or tell for what purpose the crown is formed on the rim nor for what purpose the pulley is made other than what may be inferred from its being mentioned as a *belt*-pulley.

We have, however, gone beyond the face of the patent and have introduced evidence which anticipates it. We have shown by William Birch the specific manufacture of *several lots* of metal-rimmed pulleys made at the Vulcan Iron Works in San Francisco, beginning about the year 1853 and running on to the year 1856. Record, pages 74–44–45–46. The Vulcan Iron Works had patterns for making ordinary cast iron pulleys. Orders were given to them for pulleys of extraordinary large sizes, some five or six feet in diameter, and having faces from

eight to eighteen inches wide. They had no patterns for casting pulleys so large. They therefore made them with wrought iron rims. In making them they cast the hub and arms together. These they called "spiders." These spiders they then fastened to a large face plate in a turning lathe, and while they were so in the lathe they bored the centers through the hub, and also turned the ends of the arms concentric in the same lathe. When one of those spiders was once fastened in the lathe the hub was bored out exactly in the center and the ends of the arms were turned exactly concentric with that center *before the spider was removed from the face plate of the lathe.*

The Vulcan Iron Works had powerful rolls for rolling common boiler iron. They used these rolls for rolling the wrought metal rims which they placed upon those pulleys. In at least one lot of these pulleys they put a crown or dish on the rim by placing a thin piece of iron longitudinally along the middle part of the wrought metal which they were turning into the rim. The rolls were, of course, very powerful, and the effect of placing the strip of iron along the middle of the rim was to make the rim slightly crowning. These rims were placed upon the pulleys. The pulleys were good practical working pulleys, and were sold and used as such. The rims had the usual crown or dish which were common to wrought metal rimmed-pulleys, and that crown or dish was made on the rim during the process of manufacture, and at the same time and by means of the same rolls which bend the rims in a circle.

On the hearing in the Circuit Court it was claimed that Mr. Birch was contradicted by Mr. Steen in regard to the rims of the pulleys being crowned which were made at the Vulcan Iron Works, but we claim that there is no such contradiction. Mr. Steen was only testifying to one lot of the pulleys, and probably did not refer to the particular lot of pulleys that Mr. Birch was testifying about. The lot or lots Mr. Birch was testifying about had faces twelve inches wide, and the strip of iron was put under the rims while they were being rolled so as to form the crown, which was about four inches wide.

Mr. Steen had been testifying only to pulleys made about 1853, when he said they were not crowned. Those were about five feet in diameter and only eight inches face. Record, pages 76–77.

These evidently were not the pulleys with twelve-inch faces that Mr. Birch testified were crowned.

Besides, Mr. Steen may easily have forgotten that any particular lot or lots of pulleys were crowned, or even may not

have noticed it at the time. Both Birch and Steen testified that many different lots of pulleys were made of those large dimensions with wrought Iron rims at the Vulcan Iron Works. Record, pages 74–76; also 78, Q. 30.

Although the drawings in the patent show a pulley with an exaggerated crown to it, the *usual* crown in pulleys is very slight. This is shown by the two pulleys which were placed in evidence, one being manufactured by the complainants' licensees, Messrs. Clot and Meese, and the other one by the defendants. The defendants' pulley in evidence is the one with *wrought iron arms*, while the one made by Clot and Meese has *cast iron arms*. One is easily distinguishable from the other. The crowning on each of these pulleys is the *usual* crown, and it is so slight that it would not be noticed at all by an ordinary observer. As already shown by actual measurement the defendants' crown is only *one-sixteenth* of an inch in a rim that was over ten inches wide. Record, page 74.

Steen says they did not consider the pulleys they made in 1853 as anything new at that time. He did not assist in making them, and whether a crown like the defendants, of only one-sixteenth of an inch, was on some of them, he would scarcely have noticed.

The usual crown is the same in large pulleys as it is in small pulleys. The belt runs to the highest point, and a very slight crown is enough. Record, latter part page 84.

Evidently a crown made as shown in the patent would throw the whole strain on the middle line of the belt. The middle part of the belt would be pulled asunder in running heavy machinery, while the sides of the belt would not touch the sides of the pulley at all. If a belt twelve inches wide were running on a wide pulley crowned as shown in the drawings of the patent, probably not more of the belt than four inches along its middle part would bear upon the pulleys so as to do any work as a belt. So far as the drawings of the patent are intended to describe "the usual" crown, they are misleading and worse than no drawings at all.

Defendants put in evidence the two English patents mentioned, both of which antedate the complainants' invention. One is the patent taken out by Robert Mathers in England, in December, 1873, and it contains the following description of the rims of his patented pulley, to wit:

"*The driving surface or rim is formed of a separate band or "strip of iron or steel of a suitable thickness, and of any breadth "required, and may also be made flat or convex. This band or "strip of iron or steel is made by bending so as to encircle or fit*

" *the bearing rim and arms*, the two ends being fitted and " joined by means of a butt plate and bolts, screws or rivets, " or in the manner of a clasp hoop with loops and cotters, or " other convenient and suitable means, so that the same may " be held firmly together." Record, page 106. And also—

" My said invention has for its object improvements in the " construction of driving drums, strap pulleys, or riggers, " whereby greater facility is afforded for fixing and removal, " and convenience of packing for transmission, *combined with* " *lightness, strength and a more even balance*, and with economy " in first cost. For these purposes in constructing drums, pul- " leys, or riggers, I employ or use a set of arms, boss, and nar- " row bearing rim, which may be whole or in halves. When " in halves they *are bolted or cottered together at the rim and boss* " *in the usual well-known manner, the boss being bored to the size* " *required, and the periphery of the narrow bearing rim being* " *suitably turned to receive a sheet steel or iron cover forming the* " *driving surface.*

" *This driving surface or rim constitutes a separate band or* " *strip of sheet iron or steel of a suitable thickness and of any* " *breadth required, and is bent into form by passing it repeatedly* " *through and between a pair of bending rolls of hard or chilled* " *metal* for the purpose of bringing it to the diameter required. " The driving rims *thus formed may be made flat or convex in* " *cross-section by means of suitable rolls*, the curvature and cold " rolling greatly increasing the rigidity and improving the " rim as a driving surface. The rim or cover is thus made to " encircle or *fit upon the turned periphery of the narrow bearing* " *rim and arms, and has its two ends fitted and joined together by* " *means of a butt plate or plates and bolts, or* by screws, *or rivets*, " or in the manner of a clasp hoop, with loops and cotters, so " that the same may be held firmly together." Record, page 107.

The description in his claim is:

" Having now described and particularly ascertained the na- " ture of my said invention, and the manner in which the " same is or may be used or carried into effect, I would observe " in conclusion that what I consider to be novel and original, " and therefore claim as the invention secured to me by the " hereinbefore in part recited letters patent, is *the construction* " *and use of driving drums, strap pulleys, or riggers, having* " *hard rolled sheet steel or iron driving rims or covers of a flat* OR " CURVED *transverse section* fitted and fixed upon a bearing rim, " arms and boss, substantially as and for the purposes herein- " before described." Record, page 108.

The " bosses," of course, mean the hubs.

The language of the Mathers patent declares that the rim constitutes a separate band of *sheet iron or steel* metal of a suitable thickness and of any breadth required. Being of *sheet* iron or steel the rim described in the Mathers patent was a rim crowned upon the surface, and, of course, was dished or concave underneath. The patent distinctly states that the rim is made of *sheet iron or steel of a suitable thickness* and *sheet iron or sheet steel is made of a uniform thickness*, so that when a pulley rim is made of sheet metal and is made curved in cross-section it is convex upon its outer surface and *must be concave or " dished " on the inner surface.* The Mathers patent does not say that the thickness of the rim is obtained by *rolling* it in any given form, but, on the contrary, it declares that it is made of *sheet* metal and that it is *bent into form.* It is true that it is *bent* by means of bending rolls. *This was identically the same means subsequently adopted by the complainant in his patent, Exhibit C.*

A claim was made in the Circuit Court that Mathers could not put his rim on the pulley as he describes if the under surface was not flat. But the patent declares that this rim or cover is made to encircle the turned periphery of the narrow bearing rim and arms, and *has its two ends fitted and joined together by means of a butt plate or plates* and bolt screws *or rivets*, etc. This is the ordinary method of fastening the two ends of a metal rim together, *and is the one that is used by the complainants.* It is shown in the drawings of the English Gubbins' patent in evidence, and it is the means adopted by both the complainants and defendants in this case. If, as claimed, the rim of the Mathers patent could not be put on the pulley if the rim was dished, how in the world could the rim ever be put on the complainants' patented pulley with the extravagant dish which it contains?

The complainants' patented pulley is so formed that the rim must be put on after the lugs are on the ends of the arms, and unless there was some well known way which mechanics understood of placing such rims so dished on the outside of the pulleys, the pulley shown in the complainants' patent would be impossible to make. The Mathers patent explains that the pulley covered by it is light and strong, and that the rim is made rigid by the bending in cross-section. These are the very qualities that complainant claims for his pulley (Medart's depositition, pages 35 and 36), and they are obtained by the same means.

Considerable testimony was drawn out from the experts as to

the *time* when the rim described in the Mathers patent was made convex in cross-sections. Complainants claimed that the convexity in cross-section of the Mathers rim was not made at the same time and with the same rolls that bent them into the circle around the diameter of the pulley. The language of the patent justifies no such conclusion. The patent declares that the sheet metal rim is bent into form by passing it repeatedly through and between bending rolls for the purpose of bringing it to the required diameter, and then says: "That the driving "rims *thus* formed may be *made* flat or convex in cross-section "by means of *suitable rolls*, the curvature and cold rolling "greatly increasing the rigidity and improving the rim as a "driving surface." There is nothing in all of this which indicates that the cross-section is not formed flat or convex at the same time that the curvature of the diameter is formed. Both the witnesses, Steen and Birch, testified that, that would be the *natural way that a mechanic would roll them.* (Record, 64 to 72; 78–81.) As Steen says on page 84, the bending of the Mathers rim into a circle must have left it either flat or crowning in cross-section. It might have been one or the other. When it was first bent into a circle it was "thus formed," and was already "made flat or convex in cross-section," according to whichever forms the rolls which had bent it into a circle were "suitable" for.

While it was not the province of the witnesses to give a construction to the language of the patent, still the witness Steen did give the exact construction and the exact reasons for the construction which a court of law would have given. Steen says, evidence, pages 81 and 82:

"As I understand, the specifications are addressed to parties "who are accustomed to doing work of the same kind, and *if* "*the specifications describe it so that a person of ordinary me-* "*chanical skill* understands the meaning of the patent specifi- "cation, it is clear enough to answer the law.

"Now, if that is the case, it is clear enough to me to make "the pulleys convex at the same time I form them up by that "specification. Of course, I am supposed to know how to "use the rolls or turn a crank or belt a pulley. I must have a "little sense. I can't start out a wooden man and do it."

On page 81 Steen says: "I don't think you should take one word of the specification by itself; you should take it as a whole."

In his statements of law, Steen was correct. Curtis on Patents, in section 262, states the familiar rule in the following language: "The entire specification and drawings are to be examined together."

Another familiar rule which Steen adopted is stated in section 261, Curtis on Patents, as follows:

"Specifications need not describe that which is within the ordinary knowledge of any workman who would be employed to put up the apparatus," etc.

See also *Loom Co.* vs. *Higgins*, 105 U. S., 580.

Almost an unlimited number of authorities might be cited to sustain these legal propositions, both of which are applied by the witness Steen in his explanation of the Mathers patent. He had the double advantage of both knowing the law and of being a mechanic; and we adopt Mr. Steen's explanations as a part of our argument in explaining what the Mathers patent shows. Steen was right when he said that the Mathers and complainants' patents both describe the same thing. Record, pages 77 and 78.

It is true that the Mathers English patent has underneath its driving rim a narrow cast iron rim.

We claim, however, that so long as the Mathers driving rim was like the Medart rim that it made no difference whether there was the narrow cast rim underneath it or not. All inventors are charged with a knowledge of the state of the art, and Medart is equally bound by the Mathers patent whether he knew of it or not. Although it is true that the mere *knowledge and use* of the thing in a foreign country would not defeat the United States patent, it is equally true that a foreign patent describing the same thing does defeat the American patent (Curtis on Patents, sections 98 and 99).

So long as the sheet iron or steel driving rim of the Mathers patent was made "convex in cross-section," and was also made to "encircle or fit upon the turned periphery of the narrow bearing rim and arms," as provided for and described in said Mathers patent, such rim so formed and fitted to the ends of the *turned periphery of which the ends of the arms formed a part*, so long was it "a wrought metal-rimmed pulley having a crown, formed on its rim during the process of manufacture, as described, and for the purposes set forth," in the first claim of complainants' patent Exhibit C, and was therefore a complete anticipation of that claim.

It required no invention to cut out the narrow cast rim of the Mathers pulley and leave it with the sheet metal-rim alone attached to the ends of the arms. The narrow cast rim in the Mathers patent made it that much stronger, and the evidence tends to show—page 93—that the Medart pulley has partially gone out of use because not strong enough for many purposes.

Record, page 88. It certainly would be that much stronger if it had the narrow cast rim under the wrought metal rim. According to the authorities, it was not invention to remove the narrow metal-rim as long as whatever function it performed was removed with it.

Walker on Patents, § 35.
Stow vs. *City of Chicago*, 3 Ban. & Ard., 92.

Much of this argument, however, we think is unnecessary to this case. A complete answer to the patent, Exhibit C, is found in the simple proposition of law, that so long as former pulleys were made of sheet metal which had the crown, either with or without the dish (because the patent *claims only the crown* without regard to the dish underneath), they are a complete anticipation of all that the claim could legally cover, for the reason that in law a patent cannot be taken out to cover an old device because that old device is made by a new machine or by a new process.

Draper vs. *Hudson*, 6 Fisher, 328.
Hatch vs. *Moffitt*, 15 Fed. Rep., 255.
Buzzell vs. *Fifield*, 7 Fed. Rep., 465.
McKloskey vs. *Dubois*, 8 Fed. Rep., 710.

In the case of *Collar Co.* vs. *Van Dusen*, 23 Wallace, on page 563, this Court said:

" Articles of manufacture *may be new in the commercial sense* " when they are *not new in the sense of the patent law.* New arti- " cles of commerce are not patentable as new manufactures, " unless it appears in the given case that the production of the " new article involved the exercise of invention or discovery " *beyond what was necessary to construct the apparatus for its* " *manufacture or production.* Nothing short of invention or " discovery will support a patent for a manufacture any more " than for an art, machine or composition of matter, for which " proposition there is abundant authority in the decisions of " this Court."

Several decisions sustaining the propositions are cited at the bottom of said page 563, 23 Wall.

The proposition, to sustain which we cite the foregoing authorities, is, that it makes no difference whether the crown was first put upon the pulley rim by the same rolls and at the same time that it was bent into a circle or not, because the *claim covers only the pulley itself* and *does not cover the means by which it was manufactured*, and that, therefore, the only ground upon which the complainants undertake to sustain the

first claim of patent Exhibit C, and which is that the patent covers the pulley when the rim was crowned and bent into a circle *at one and the same time and by the same rolls*, although it might not cover the pulley when its rim was bent into a circle at one time and crowned at another, is without any legal support.

Complainants assert that the defendants' rims must have been bent and crowned at the same operation, because, as they assert, they could not have been made any other way. Although this, as we say, is an immaterial statement, we do not accede to it.

The iron rimmed pulley to which Henry H. Lynch, one of complainants' witnesses, testified was crowned by hammering, and this was doubtless done after it was bent into a circle. Record, page 101.

If complainants' are correct in asserting that the defendants' rims could not be crowned except at the same time and by the same rolls that bent them round, Steen and Birch must be correct when they say that skilled mechanics would roll the rims that way. Mathers' patent describes rims rolled out of sheet metal. If the said method was the only way in which they could be rolled Steen must have given the Mathers patent the correct construction.

We assert that the first claim of said patent, Exhibit C, is void for the reasons:

First—That it appears upon the face of the patent that it only covers an ordinary wrought metal-rimmed pulley, having an ordinary crown, which was put upon it during the process of manufacture, which was the same and only time that the "usual crowns" always must have been placed upon other pulleys.

Second—The claim was anticipated by the description in the Mathers patent.

Third—It was also anticipated by some of the pulleys which were made from 1853 to 1856 at the Vulcan Iron Works.

Fourth—It was anticipated by the pulley which the witness Lynch had made, in which the crown was made upon the pulley by hammering.

Fifth—It was also anticipated by the common knowledge of the world.

Patent No. 248,598, Exhibit "B."

This patent is for a belt-pulley, but it is entirely different from Exhibit C. Instead of *wooden* arms it has *cast iron* arms. And *instead of a crowned* and dished rim it shows and describes

only a rim that is *perfectly flat*. The specifications of this patent are very short, containing less than two pages of the record. (Record, pages 29 and 30.) The pulley is constructed, according to the specifications, by casting the hub and arms with cross-lugs on the ends of the arms all together, thus forming the spider. This cast spider is then centered and bored. The ends of the arms or bracket-lugs upon which the rim is laid are then ground *or turned* off by any suitable machinery exactly concentric with the axis of the pulley. The rim is rolled perfectly true and uniform in shape so as to be exactly concentric at every point with the pulley axis when laid around the spider. The rim is then ground concentrically with the axis.

This patent we claim to be invalid for the reasons:

First—That the result which the specifications state is produced by the invention is not and cannot be produced by the means described.

Second—That the difference between the ordinary pulley and the pulley described in the patent does not involve invention, but only mechanical skill.

Third—There is nothing described in the specifications even if the means there mentioned would produce the result as there stated, except a greater *degree* of perfection in the balancing of belt-pulleys, and a mere *difference in degree is not patentable*.

In this patent nothing is described except a pulley with ordinary, cast hubs, arms and lugs and a wrought metal rim. *It has no new parts. It has no new arrangement of parts* of any kind. *It has no new operation of any kind.* It performs no work except what old pulleys performed; it does its work only in the same manner that other pulleys did their work. It is not made of any different material from what the older pulleys were made of. *Not an element in it, either alone or in combination, performs any service that the same corresponding element did not perform in the old pulleys.* The specifications state that this invention consists in a pulley which is *perfectly balanced*, that is, "a pulley in which the center of gravity and geometrical center or axis coincide."

Much of the specifications of Exhibit B is taken up with describing the defects of various kinds of pulleys in use prior to the date of the invention, those defects being that the pulleys were not perfectly balanced, on account of contraction in cooling, etc. It then states that the advantage of having pulleys of *absolute accurate* balance and shape are so well known and sought after that it was not necessary to explain them. It

states that the accompanying drawing is a vertical section of a belt-pulley illustrating the invention. It then states: "In "making my pulley the cast spider, A, is centered and bored. "The ends of the arms or the faces of the bracket-lugs, *a*, "upon which the rim is laid are then ground *or turned* off, by "any suitable machinery, exactly concentric with the axis of "the pulley."

The patentee states that by thus preparing the spider the rim B, which is rolled perfectly true and uniform in shape, will be exactly concentric at every point, and the pulley will therefore be accurately balanced. That in order to make the pulley even more true in shape and perfectly balanced, "I then grind the rim concentrically with the axis." He then states that the center of gravity of a pulley thus made is brought to coincide with its geometrical center more absolutely than has heretofore been done. The specifications then explain that *it is obvious* that if the pulley arms are not first ground off concentrically with the axis, all the inequalities incident to the operation of casting and cooling would remain as defects in the spider, and would be *greatly aggravated by the grinding of the rim*, because the length of the spider arms being unequal, in some portions more and in others less, making it unequal in thickness, so that the final grinding operation, in order to make the pulley perfectly circular, will greatly increase its want of balance. But by preparing the spider as above described, all difficulties are cured and pulleys of true shape and balance are produced.

The patentee states that he makes no claim to the process of making the perfectly balanced pulley. The claims are as follows:

"1. The improved belt-pulley herein described, having the "ends of the spider arms ground off concentrically with the "axis of the pulley.

"2. The improved belt-pulley herein described, in which "the rim and the ends of the spider arms are ground off con-"centrically with the axis of the pulley."

In order to infringe either one of these claims the ends of the spider arms must have been ground off. If the ends of the arms were not ground off it would be no infringement of either of the claims if the face of the rim should be ground off.

This patent, like the former one, is very short in its description of the alleged invention. In the first few lines of the specifications is the general statement that Philip Medart has invented improvements in belt-pulleys. Then follows a general statement of the class of pulleys to which the invention belongs and of what the invention consists. Next follows a general

statement of what purports to be the state of the art with regard to belt-pulleys, alleging that they are not properly balanced, and stating the reason why. Next follows the statement that the *advantages* of having pulleys of absolute accurate balance and shape *are well known*, and therefore it is not necessary to explain them. Next follows the lines descriptive of the alleged invention which we have quoted. Then follows a statement that in pulleys made according to the description of the patent, the center of gravity coincides with the geometrical center more absolutely than has heretofore been done. After this follows a statement that certain things with regard to not grinding off the arms, etc., *are obvious*, but that by preparing the spider as above described all difficulties are cured and the true shape and balance are produced. Next is the statement that no claim is made to the process of making the perfectly balanced pulleys. The remainder includes the claims, already quoted, the attestation and the names of the patentee and the subscribing witnesses.

The following lines include all that is descriptive of the invention in the specifications except the drawing, viz.:

"My improved pulley belongs to *that class* of pulleys com-
"posed of a separate spider, *usually* of cast metal, and a
"wrought metal-rim, which is secured to the spider; and *my*
"*invention consists in a pulley which is perfectly true and ac-*
"*curately balanced*—that is, a pulley in which the center of
"gravity and geometrical center or axis coincide."

"* * * The accompanying drawing is a vertical section
"of a belt-pulley illustrating my invention.

"In making my pulley the cast-spider, A, is centered and
"bored. The ends of the arms or the faces of the bracket-
"lugs, *a*, upon which the rim is laid, are then ground *or*
"*turned* off by any suitable machinery exactly concentric with
"the axis of the pulley. By thus preparing the spider the
"rim B, which is rolled perfectly true and uniform in shape,
"will be exactly concentric at every point with the pulley axis
"when laid around the spider, and the pulley will therefore
"be accurately balanced. In order to make the pulley even
"more true in shape and perfectly balanced, I then grind the
"rim concentrically with the axis." * * *

"What I claim is:

"1. The improved belt-pulley herein described, having the
"ends of the spider-arms ground off concentrically with the
"axis of the pulley.

"2. The improved belt-pulley herein described, in which the

" rim and the ends of the spider-arms are ground off concen-
" trically with the axis of the pulley."

Scant as is the foregoing description, it is still ample. The specifications of a patent are to be read in the light of common knowledge, and the knowledge possessed by ordinary mechanics. Ordinary mechanics knew what grinding or turning off the ends of the arms and the face of the rim means, and they knew, by virtue of their knowledge as mechanics, how to do it. None of the steps to be taken in constructing the pulley as described in the specifications required any explanation. None of them were new or constituted any invention, for the reason that they were all well known to mechanics already. The patentee recognized this fact when he made out those specifications *with no explanations as to how each step was to be performed.* He does not tell what kind of a lathe or what kind of a grinding machine was to be used in turning or grinding off the ends of the arms, or in grinding off the face of the rim. He knew that none were needed, because *he knew that those things were well known already.* This is shown in the testimony of at least three of the witnesses, including Mr. Meese, as we will point out specifically hereafter.

But while we admit the sufficiency of the description on account of everything contained in it being so well understood, we claim the benefit of the fact, as it largely assists in showing that there was no invention made by simply constructing a well known article by well known processes and mechanical operations which involved only mechanical skill, and did not admit of any application of any new invention. There was no new discovery. The specifications themselves state that the advantages of perfectly balanced pulleys *were well known.*

Taking the patent *for all that it says,* and, even then, there is nothing new about it except the manner or process adopted in its manufacture, which resulted in making a pulley with the face of its rim perfectly concentric with its axis of rotation, and a pulley perfectly balanced. We have shown, however, by the testimony that the result of obtaining a perfectly balanced pulley by the method described was impossible. We showed this by introducing one of the pulleys made by Messrs. Clot and Meese under and in accordance with the patent. This pulley was two and a half ounces out of balance by actual test made before the examiner while taking the testimony. We have also shown it by the testimony of Birch and Steen. Mr. Birch's testimony upon this point is contained in the Record, pages 53 and 54, and that of Mr. Steen is on page 88. Mr. Meese also testifies to the impossibility of making a perfectly balanced pulley. Record, 97.

Now it is obvious that when the hole is bored through the hub *where the center of gravity occurs* that the misshapen spider, with all its irregularities, will be exactly balanced. But while thus actually balanced upon its center of gravity the ends of its arms are unequal. *It has not yet been made concentric.* The ends of the arms are heavy cast lugs made to fit crosswise with the inner surface of the pulley rim. To make the ends of the arms concentric they are ground off until they are all of an *exact equal length. As they were of unequal length before the grinding,* and while the pulley was perfectly balanced by having been bored through its exact center of gravity, *some of the longer arms must be ground off more than others,* in order to make their outer ends concentric with the geometrical center. Every particle of the metal thus ground off has more or less weight. As more is ground off from some of the arms than is ground off from others, the weights of those arms which have a considerable amount ground off of them is considerably changed, while the weights of the arms which had shrunk more in casting, and were therefore shorter, would have less metal ground off of them, and therefore their weights would not be as much changed by the concentric grinding as would the weights of the longer arms. Now it is evident that if the pulley was exactly balanced *before the grinding commenced,* that *the grinding must destroy that balance,* because it would necessarily grind more off from the lugs of some of the arms than it would grind off of the others. This *must* be so, or else *all of the statements in the patent as to the irregularity caused by the casting are untrue.* The evidence, however, already referred to, shows that those statements are true, and that those irregularities do occur in practice. When the center of gravity and the exact balance of the spider is thus destroyed by the concentric grinding, which necessarily grinds more weight off of some of the arms than it does off of the others, *no means are provided in the patent for ever restoring such center of gravity, and* exact balance of the spider. This same kind of explanation is contained in the patent in reference to other pulleys. The patent applies it to the grinding off of the rim instead of applying it to the grinding off of the arms. It is an explanation, therefore, which the patentee perfectly understood at the time that he signed those specifications. It is an explanation which is not only obvious, but is thoroughly sustained by the evidence. The statement made in the patent, to the effect that the invention "Consists in a pulley *which is perfectly true and accurately balanced;* that is, a pulley in which the *center of gravity and geometrical center or axis coincide,*" cannot be and is not correct.

It is true that the Medart pulleys are nearly enough balanced for practical purposes. But so were the pulleys made according to the first Medart patent, as well as the pulleys made at the Vulcan Iron Works, well enough balanced for practical purposes. The patent is not taken out for a pulley well enough balanced for practical purposes. The result of the invention, if the patent is true, is a *perfectly balanced pulley, and* for a *perfectly concentrically faced pulley*, in which the center of gravity and the geometrical center *exactly coincide*. This is the result which the patent declares is produced by the invention. This is the result accomplished, *as stated in the patent;* and unless this result is accomplished, viz.: a perfectly balanced pulley, *in which the geometrical center and the center of gravity exactly coincide*, or at least coincide more closely than they ever coincided in other pulleys, then the result called for by the patent is not accomplished, and the patent is void, not only because no invention has been made, but because the means described in the patent will not accomplish the result which the patent says they will.

Mitchell vs. *Tilghman*, 19 Wallace, p. 396.
O'Reilly vs. *Morse*, 15 Howard, p. 119.
Curtis on Patents, § 449; § 105.
Whitely vs. *Swayne*, 7 Wall., 685.

In the descriptive part of the patent, which describes the invention, and which we have already quoted, it says:

That "the bracket-lugs, *a*, upon which the rim is laid, are then ground *or turned* off," * * * and, "I then grind the rim concentrically with the axis."

This is all that is said about the grinding in that part of the specifications which describes what the invention is; and in this the *grinding and turning are mentioned as equivalent means* for making the ends of the arms concentric. There is no explanation or any intimation in the patent that there is any difference for practical purposes between grinding or turning off the ends of the arms. There is no statement or any hint in the patent that turning would not serve all the purposes of the grinding. The distinction between the grinding and the turning is not stated or hinted at in the patent, and we have shown by the testimony that it makes no difference in the pulleys whether they are turned or ground.

Although this is obvious from "common knowledge," we have proved it by Mr. Meese, and by Birch and by Steen.

Mr. Meese testifies on pages 40 and 41 as follows:

"Q. 4.—What difference does it make whether the ends of

" the arms are made concentric with the center of the pulley " by grinding, or whether they are so made concentric by any " other method, such as turning or filing?

" A.—It makes no difference so far as the quality of the " pulley is concerned, but in economy of workmanship it " makes a difference.

" Q. 5.—When the pulley is finished, would there be any " difference in the value of it whether the ends of the arms " were made concentric by some one of the methods men- " tioned, or by one of the others—that is, whether they were " made concentric by grinding, or by turning, or by filing, or " by dressing with a coal chisel, or by any of the other well- " known methods of shaping iron?

"A.—As a pulley they would be of the same value if made " perfectly concentric, by either method.

"Q. 6.—Will you please name over such as you can of the " well known methods of shaping iron which were commonly " practiced by metal manufacturers long prior to the year 1880?

"A.—Iron was shaped into form by turning, planing, filing " and chipping with a coal chisel."

On page 50 Mr. Birch testifies as follows:

" Q. 47½.—In the pulley in evidence, does it make any dif- " ference in the pulley itself whether the outer end of those " arms are dressed concentric with the center of the axis by " being ground instead of being turned or dressed by other " methods known to machinists?

"A.—It would make no difference at all as long as they were " made true. You can make them true in a great many differ- " ent ways, by grinding them, or working them on a chipping " machine, or dressing them by a file, or mill them; but what- " ever way you do that work you take the cheapest and shortest " way of doing it."

On page 77, Mr. Steen testifies as follows:

" Q. 23.—When the pulley is finished, state whether or not " it makes any difference in the pulley itself whether it is made " concentric by grinding the ends of the arms, or by dressing " them in any other of the usual ways known to mechanics?

"A.—There would be no difference.

"Q. 24.—Would it have any effect whatever on the pulley it- " self, after it was finished?

"A.—No; none."

We have also shown by the testimony, that grinding was just as well understood by mechanics as was turning (Record, pages 50 to 59, also 77). Both were processes perfectly well understood and known, and were in common practice. Grinding

has always been resorted to wherever the substances were too hard to turn. Grindstones are one of the most ordinary implements that we have ever known for shaping hard-tempered steel. Edge-tools are almost always ground. In all factories where steel saws are made, they are shaped and made perfectly true on their flat sides, after they are tempered hard, by hammering and subsequent grinding. Saws, in being tempered, spring and change their shape. They are reduced to a flat condition again after they are tempered by hammering, and after they are hammered they are made smooth and polished upon both sides and perfectly true by grinding. This is a part of the most elementary "common knowledge" in connection with saw-making.

We have proved by William Birch, that the Vulcan Foundry made rolls for the U. S. Mint, where our gold and silver coin is made. Those rolls were made of iron *cast in a chill which made them very hard* on the surface, and very difficult to turn true, although many of them were turned. Afterwards they obtained a machine made in the East for grinding the surfaces of those rolls, and also for grinding the journals upon which they turned. That machine was used, and with it the surfaces of the rolls used in the U. S. Mint were ground perfectly true, and the surfaces of the journals upon which they revolved were also ground perfectly true. That same identical grinding machine was turned over to the U. S. Mint here in San Francisco, and it is there still in use for grinding the surfaces and journals of similar rolls. Record 56, Q. 14. Those rolls were cast solid, their surfaces and journals were ground exactly true and concentric with their axis, and of course they were perfectly balanced. Record, pages 50, 51 and 52. Although it is enough for ordinary pulleys to be practically well balanced and practically concentric, such is not enough for the rolls through which the precious metals are passed for manufacturing coin, where every coin must be of one exact standard weight without one particle of deviation. The exactness of their work requires for the rolls a corresponding exactness of surface and of journals. Medart's pulleys are but rough jobs as compared with those finely finished and exactly balanced Mint rolls.

Although those Mint rolls were not belt pulleys, they being solid metal were perfectly balanced, and were made exactly concentric by the grinding process; and the authorities are uniform in holding that it is not a patentable invention to apply an old process to a new object that is analagous in its nature to the old objects to which the same process had been applied.

Tucker vs. *Spaulding*, 13 Wall., pages 455 and 456.

Curtis on Patents, § 49 to § 56.
Walker on Patents, § 38.

Further, Mr. Steen testifies to the grinding of *pulleys* in 1847, at the establishment of Jenks at Bridesburg, about eight miles from Philadelphia, by a manufacturer engaged in the manufacture of cotton machinery. Record, page 77.

If the patentee had supposed for a moment that he was the inventor of the grinding process, he certainly would have explained in his patent how the grinding was accomplished, and some kind of a grinding machine by which the grinding was done. He, however, does nothing of the kind, but leaves it to be understood that the mechanics who would make their pulleys would know perfectly well from the knowledge of their business, and as mechanics, what kind of grinding machines were necessary, and how they were to be operated. There is not in the patent the slightest hint or intimation that the grinding process, *per se*, was any part of the invention.

The evidence, already cited, shows *without contradiction* that the pulleys themselves were the same whether they were made concentric by turning or by grinding.

The testimony put in by the defendants was allowed to pass unchallenged by the complainants. Not the least attempt was made to contradict any of the facts to which either Birch or Steen testified. There is a difference of opinion among the witnesses as to the meaning of the terms used in the Mathers patent, but as to any actual facts to which either Birch or Steen testified no attempt was made to question any of those facts. That several lots of metal-rimmed large powerful pulleys were made at the Vulcan Iron Works long prior to the complainants' invention stands proved by uncontradicted testimony. That the rolls were made for the U. S. Mint in San Francisco long prior to the said invention also stands as an uncontradicted fact, as does also the fact that those rolls were *finished by grinding and to absolute perfection*, and by a grinding machine which has ever since been in use in the same Mint for finishing the same kind of rolls.

This Court has made so many decisions as to what does not constitute patentable inventions, and is so very familiar with this issue that we should feel out of place in making any pretense of discussing the general principle in a case so plain as is the present one. The most that the complainants can pretend to claim is that they made pulleys with the same old parts of hubs, arms and rims, *and finished* them to a higher *degree* of perfection, as to balance and concentricity, than had been be-

fore attained, and that this higher degree of perfection was attained by use of ordinary mechanical skill and knowledge only.

We respectfully submit that there is nothing disclosed in the patent which reaches into the realm of invention.

As this Court said in *Smith* vs. *Nichols*, 21 Wallace, 112:

" But a mere carrying forward or new or more extended ap-
" plication of the original thought, a change only in form,
" proportions or degree, the substitution of equivalents, doing
" substantially the same thing in the same way by substan-
" tially the same means with better results, is not such inven-
" tion as will sustain a patent."

Infringement.

Upon the question of infringement, the evidence is meager. The complainants required us to answer under oath, and we have under oath denied the infringement. That denial counts as two witnesses in our favor. Precisely what steps the defendant took in manufacturing its pulleys are not shown. No one has testified who knew what those steps were. The complainants' spider on which the crowned rim was placed had wooden arms, and in the other patent on which the straight rim was placed, the spider had *cast iron* arms.

The great irregularities, which the invention purports to correct, *grew out of the casting of those cast iron* arms. The defendant has neither used *wooden* arms *nor cast iron* arms, but has used *wrought iron arms only*. Those wrought iron arms retain their shape and form unaffected by the operations of casting. How the ends of those arms were made concentric with the axis of the pulley is not developed by the testimony. Whether the face of the pulley was ground or turned is not determined by the testimony. The different witnesses had different opinions in this regard, and no one has testified, *who knew*, whether the faces of the defendants' rim was ground or turned. The burden of proof to show infringement is upon complainants. It certainly has not been shown that the defendant followed the steps described in the so-called process patent, Exhibit A. It has not made any pulleys with cast metal arms, nor do we think that it has been fairly shown that it ground the ends of the pulley arms or the face of the pulley rim as called for by patent Exhibit B. The defendant has not made any pulleys with wooden arms and it certainly has not put any such crown upon its pulleys as is shown in the first patent, Exhibit C, either during the process of manufacture or at all. Neither is it shown that

the defendant succeeded in making any such perfectly balanced pulleys *as the complainants' patent states would be made by following the process and several steps called for by those patents.*

Upon all points we claim that the defendants are entitled to a decree in their favor herein.

Respectfully submitted,

M. A. WHEATON,
FRANK J. KIERCE AND
E. R. TAYLOR,
Counsel for Appellant.

APPELLEE'S BRIEF AND ARGUMENT.

Supreme Court of the United States.

OCTOBER TERM, 1894.

NO. 164.

THE RISDEN IRON AND LOCOMOTIVE WORKS, *Appellant*,

vs.

PHILIP & WILLIAM MEDART, *Appellee*.

STATEMENT.

This suit was brought for the infringement of patents No. 248599, 248,598, and patent 238,702, all for improvement in Belt Pulleys, marked respectively Exhibits A, B and C. See R. p. 23, 25, 29 and 33. After bill was filed and service had, the Appellants filed a demurrer to the bill especially because the patents do not show invention on their face. This demurrer was fully argued and upon due consideration was overruled.

Afterwards the Appellants filed their joint answer, whereupon the Appellees filed their replication to answer.

The proofs were taken, case argued fully by both counsel, and the Court gave judgment for complainants and enjoined the Appellants from further manufacture of Belt pulleys covered by either of

the patents. Whereupon the Appellants and Appellees agreed on amount of damage, final judgment was rendered and an appeal taken tothis Court by the defendants, these Appellants.

The decree may be found on p. 13 of the Record.

UTILITY AND ADVANTAGES OF THE INVENTION.

The patents ex. A, (H) p. 23–28; ex. B, p. 28–32 and ex. C, p. 32–35, clearly show the purport and advantages of the invention as well as what it consists in; and for me to try to re-explain it would be only multiplying words.

The advantages of the pulleys secured by these patents over other pulleys as told by the witnesses will be found on page 35, Q. 14–22, on p. 36. According to the patents the invention consists

1ST:

In constructing the usual crown or dish on the rim of a pulley by bending it transversely during the process of manufacture; and claims "A wrought metal rimmed pulley having a crown (or the usual crown common to belt pulleys) formed on its rim during the process of manufacture, as described" (that is by bending it transversely and in a circle at one and the same time). See claim of patent, p. 33.

Or, in the language of the patent, p. 33, 2d paragraph: "The crown or dish "D," usual to belt pulleys is formed on the rim D by bending or dishing the rim during the process of manufacture, preferably at the same time and by means of the same rolls, that bend the rim into the required circular shape."

Briefly speaking then what the patentee has invented in this patent is a composit belt pulley having a wrought iron rim made of a long piece of sheet steel convex on the outer and concave on inner

surface and bent into a circle so as to form a rim for a pulley, and when secured to the arms and hub, making a pulley.

2D:

This invention further consists as seen in the patent, p. 27 of Record in centering the pulley center or spider and then grinding the same concentrically with the axis of the pulley. It further consists, as shown by second claim of patent, p. 27 of the Record, in then securing the rim thereto. It further consists as shown by the third claim, same page, in then grinding or squaring the edges of the rim.

It further consists in a composit pulley consisting of a center or spider, and a rim being built up from a common center whereby a pulley is secured, which is " perfectly balanced and faultless in shape, strong and durable, and which is produced more rapidly and at less expense than the imperfect pulleys heretofore produced." (See Record page 27). It further consists as shown by patent No. 248,598 Record page 30, and claimed in the two claims of an improved belt pulley, having the ends of the spider arms ground off concentrically with the axis of the pulley; and of an improved belt pulley in which the *rim* and the *ends* of the spider arms are both ground off concentrically with the axis of the pulley.

That is where the rim or spider arms are one or both ground concentrically with the center of motion.

These are great advantages in the manufacture of belt pulleys and have been recognized by those versed in the use of belt pulleys to the extent of the purchase of 200.000 pulleys in the last seven years. (See Q 22, p. 36).

The recognition of the trade in an article is the very best evidence that it contains patentable invention. See cases cited.

These composit pulleys, such as those in evidence, have superceded all cast iron pulleys not entirely, says Steen, defendants' witness,

but there has been a great many of them sold. (P. 87, Q. 5.) At one time they were a favorite and did largely supercede the old cast iron pulley. (P. 88, Q. 7.)

The Medart pulleys are perfectly balanced pulleys, according to defendants' witnesses. (P. 87, Q. 1; P. 88, Q's 8–16.)

The Medart pulleys made by us are usually more perfectly balanced than this one. (P. 91, Q's 22–27.) We have tested them—have never heard any complaint, though we have filled orders for perfectly balanced pulleys. (P. 91. Q's 27–33.)

THE PATENTS SUED ON AND THEIR INTERPRETATION.

Justice Curtis, in the well considered case of Winans vs. Dermead, 15 Howe, p. 330–348, has laid down some very important rules for the interpretation of patents and consideration of patent causes, among which are the following:

"To construe a patent you must find out what the patentee has invented, and construe the claims liberally in the favor of the inventor, so as to sustain his patent, and cover, if possible, his whole invention; and in doing so you must brush away all technicalities and get at the real invention, glean from all the light that can be derived from the specifications, plans, drawings and models, without doing violence to the language of the description or plans."

"In doing this, he says the first thing to be done is to find out what is the structure or device described and shown as embodying his invention.

"2d—What is the principle of the invention or mode of operation introduced and employed by this structure or device.

"3d—What result is attained by means of this principle or mode of operation."

As to construction of patents see also Consolidate Roller Mill Company vs. Combs.—Official Gazette, July 9th, 1889.

Applying these rules and the rules which are familiar to your Honors, let us examine the patents sued on in accordance therewith.

In doing so I will commence with patent 238,702, being Exhibit C.

The patentee says this invention consists, First, In constructing the usual crown or dish on the rim of wrought metal rimmed pulleys, by bending said rim transversely during the process of manufacture. (See Patents, lines 19–23 of specification), and also, "The crown or dish "D" usual to belt pulleys is formed on the rim "D" by bending or dishing the rim during the process of manufacture, preferably at the same time and by means of the same rolls that bend the rim into the required circular shape."

Now, what is meant in this specification by the terms "the usual crown or dish" and "the crown or dish to usual belt pulleys" is, that the patentee makes the crown or dish which the pulleys have, and which they have had for years, and which is "usual to belt pulleys" as he says, and puts it on the rim of wrought metal rimmed pulleys by bending the rim transversely during the process of manufacture" so as to have a concave as well as a convex surface on the rim, and not merely rolling the convex surface on the face of the rim and leaving the under side flat. That he puts on the rim of a wrought metal rim pulley the crown usual to belt pulleys, and then he puts this rim, after the crown is put on it onto a metal spider consisting of arms and hub. That is one thing which he does which is new. He also does another new thing, he makes this crown on the rim by bending the rim concave and convex and into a circle preferably at one and the same time and with one set of rolls.

That is, he has invented, made for the first time, a wrought metal rim and attached it to a spider, which rim, has the crown usual to

belt pulleys. This wrought metal rim, having a crown on it and a concave inner surface, which crown is usual to belt pulleys, such as cast iron and wooden pulleys, is a new thing in itself as a wrought metal rim, and is full of utility and advantages standing alone as a rim, and has much more utility and many more advantages, when combined with arms and hub constituting the spider, as the patentees patent does, and as is shown in the pulley marked Complainants' Meese pulley, and the defendant's pulley marked Complainants Exhibit, Respondents' Pulley.

The Complainants then in this patent have invented and for the first time have put upon a spider consisting of hub and arms a wrought metal rim with a crown usual to belt pulleys made on the rim, and have not, as the Defendants' Attorney would have the Court believe, simply invented how to make a wrought metal rim by bending it and crowning it at one and the same time; and the patentee does not acknowledge by his specification, as the Attorney would have you believe, that crowned or dished wrought iron metal rims were ever before used on pulleys composed of a spider and rim. For if he did acknowledge that that had been done it would be extreme folly for him to embody it in his claim. No such interpretation as that contended for by the Defendants Attorney can be put upon the specification unless the Court does "violence to the language used."

But, if interpreted fairly, he has invented a wrought metal rimmed pulley having a crown "d" formed on its rim during the process of manufacture as described. "That is a wrought metal rim concaved and convexed and bent into a circle before it is attached to the spider which is during the process of manufacture," and then attached to a spider consisting of arms with lugs at their ends and a hub or center. In other words, it is a wrought metal rimmed pulley, having a crown put on the rim while it is being made into a rim or while it is being manufactured, which is what is meant by the words "during the pro-

cess of manufacture" used in the specification, and then attaching this rim, so crowned to the metal spider. This is what constitutes the patentee's invention; and not alone the making of the crowned wrought metal rim, but as made and adapted to, and connected with and combined with the spider, consisting of arms, lugs and a center or hub. The advantages of this construction of a wrought metal rimmed pulley are, "that the rim can be made much thinner and lighter with the same strength, and being in that shape tends to stiffen it." "Cast iron pulleys cannot be practicably made with the rim in that shape," that is, concave. "They will not draw from the sand." (See Medart's direct evidence, answer 19.)

"The rim is made of less material and gets the same result, the difference being that amount of metal which would lie between a straight line from edge to edge and the curve in the under portion of the rim.' This makes it lighter and cheaper." (See Medart's direct evidence, Answer 20, p. 35.)

"It will be less liable to fly asunder."—(See Medart's evidence, answer 21).

"The rim rolled to an even thickness and then attached to the arms leaves the rim a well balanced portion of the pulley."—(See Medart's evidence, answer 21).

The crowning and even thickness of this rim and its perfect curve and uniform crown made by rolls at one and the same time enables the patentee to apply it to a spider without the intervention of a cast iron rim underneath it to support it.

ENGLISH PATENTS.

To limit the scope of these patents the defendants have introduced the English Mathers' Patent. The pulley therein described consists of a common cast iron pulley, having a cast iron rim or rims and a wrought iron driving rim on the outside of this cast iron rim

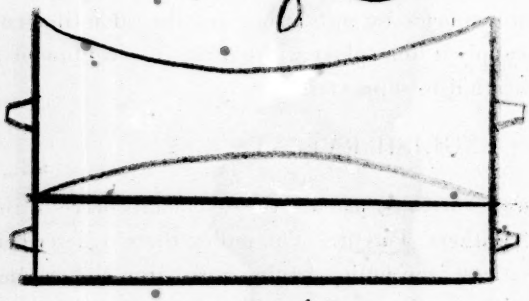
or rims. It has two rims, a cast iron rim, and a wrought iron rim; and sometimes two cast iron.

See Fig. 1 and Specification, lines 22–29, p. 107 and last paragraph of p. 107.

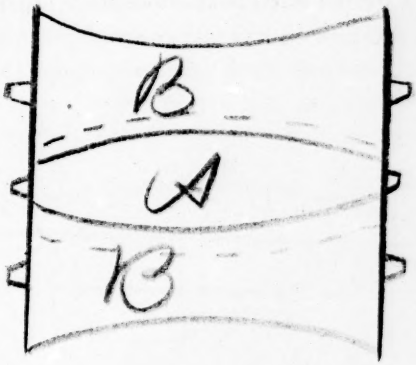
The driving rim is flat on under surface; First, because it has means described for securing this rim to the bearing rim or rims, and because this driving rim is *rolled*, not bent into a convex outer surface by "cold rolling," not by bending.—(See page 107, 4th paragraph.) And 2d, because it could not be made concave as made.

This rim is bent into a circle first by bending rolls and then after it is thus formed, as the patentee says, it may be made flat or convex in cross section by means of suitable rolls, the curvature and cold rolling (not bending) greatly increasing its rigidity and improving the rim as a driving surface. The rim is first bent into a circle and the face of the rim is rolled convex, not bent convex and concave as in Complainant's patent. It is thus rolled by means of rolls probably like Fig. 2.

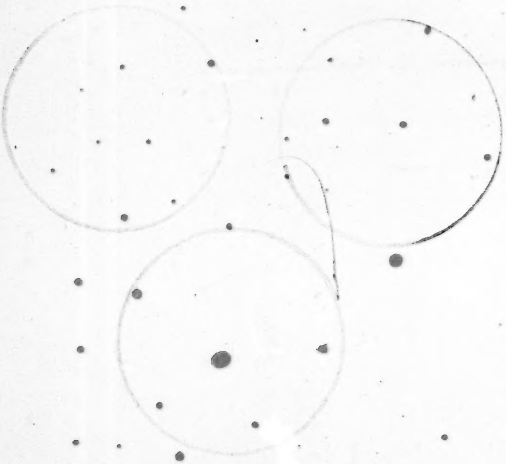
Fig 2

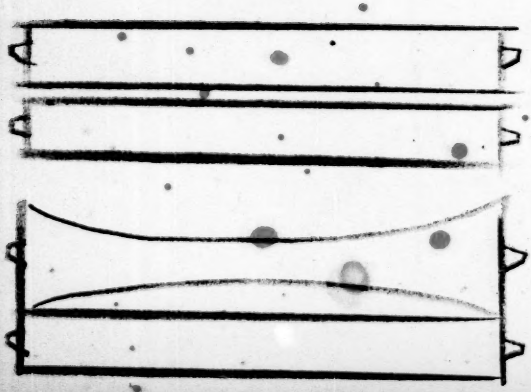


It is not bent by means of rolls like those shown in patent, Fig's 4 and 5, p. 24–(44,) into a convex and concave form in cross section.



The patentee says the rim, after it is bent into form by passing it repeatedly through a pair of bending rolls for the purpose of bringing it into the diameter required, goes on to say that the driving rim thus formed, that is the rim that has been bent into the diameter required, may be made flat or convex in cross section.—(See p. 107 and Fig's 3, 4 and 5.) First bent into a circle; then rolled flat or convex.





It is not convex and concave, rolled to an even thickness and then made concave and convex and then bent into a circle by rolls preferably as the Medart's rim is.

Mathers never dreamed that a rim could be rolled concave and convex and into a circle for a pulley.

He saw the difficulty, which Meese saw and did not think it could be done.—(See Meese evidence, p. 43, Q's. 25 and 26.) Fig. 6, is cross section of the Mathers rim; Fig. 7, of Medart rim.

Fig 6

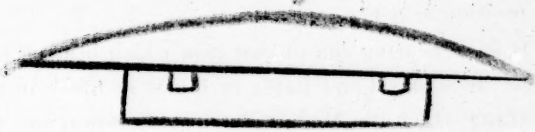


Fig 7

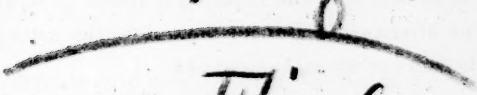
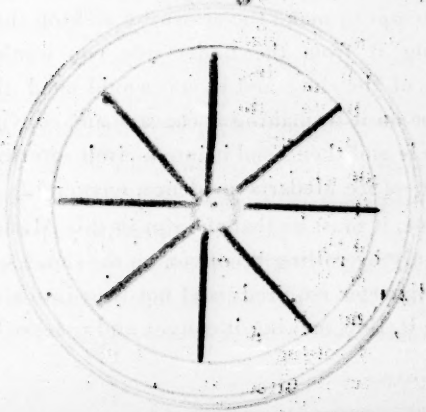


Fig 6



Mathers could not put his rim on the pulley as he describes it if under the surface was not flat. He never would have said that he "uses projections on the inner side of the driving rim fitting into corresponding recesses in the periphery of the bearing rim to secure and retain the driving rim when in position," if the under part of his rim had been concave and not flat.—(See lines 30—35, Specification of Mathers' Patent. [P. 107.]

It is plain, if the rim was concave as well as convex, it would be retained in position on the bearing rim by reason of its concave under surface and would not need projections on the inner side to hold it in position as it has. (P. 107.)

It has a bearing rim of cast iron which bearing rim will shrink, become unbalanced and liable to crack or break in the casting, the very thing which the Medart Patent overcomes, and which makes it valuable. Mathers' is the old cast iron pulley with a wrought iron rim over it.

The rim is bent into the required diameter first, and then may be made convex afterward. But nowhere does the patentee say that the rim is made concave as well as convex.

It could not be made convex and concave both by any rolls whatever, after it was first bent into a circle, for the moment you would attempt to make the crown by making the under side concave, by bending it from the under side, you would straighten out the curvature of the rim; and if you would bend the convex and concave shape on it by making it concave and convex before you bent it into a circle and then bend it into a circle afterwards, you would kink the edges.—(See Medarts' evidence, answer 12).

Hence, it must be that the rim in this Mathers patent is made convex only by rolling it convex on the outer surface after it is bent into the diameter required; and not bent into a circle and the crown bent into it, thus making it convex and *concave* both, as Medart's is.

The differences, then, between the Medart Pulley and the Mathers pulley, are :

First :—The Mathers pulley has a bearing rim of cast iron passing clear around the pulley and cast in one piece with the arms and hub, as an ordinary cast iron pulley, and then to this rim or pulley the driving rim is attached by means of projections entering into recesses, thus retaining all the defects of the old cast pulley, while the Medart pulley has a wrought metal rim attached directly to the arms of the pulley, thus dispensing with the cast iron rim found in the Mathers pulley, and dispensing with all the difficulties which are inherent in the cast pulleys.

Second :—The Mathers pulley may be rolled convex on the outside of the driving rim, but it is always flat on the inside, the convexity being rolled out by means of rolls and not bent in ; while Medart's is always concave when it is convex and is bent in concave and convex shape in cross section, and not rolled convex alone as Mather's is.

These differences are exactly what has made the Medart pulley a practical, equally balanced pulley, and what has made it a successful device, (See 2d and 3d paragraph of Medart patent, R. p. 29 ; also p. 32 Medart evidence, p. 35, Q's 14–23.) (See Q. 36, p. 49), and brought it into general use, made it strong, durable, cheap and light ; and what has made it easy of transportation and the rim in all its portions equally balanced and of equal thickness.

But it makes no sort of difference so far as this case is concerned, whether the Mathers English Patent has its rim made like the Medart rim or not. There is one difference and that is it has a cast iron rim which difference makes it an entirely different invention from the Medart pulley. This leaves the Medart pulley the first wrought metal rim pulley which has the usual crown on the rim and which

has the rim thus formed attached to a metal spider consisting of hub and arms.

As the claim puts it, "a wrought metal rim pulley having a crown "d" formed on its rim during the process of manufacture, as described, and for the purposes set forth."

The defendants own witnesses have to admit this interpretation of Mather's patent.

The witness, Birch, does not know whether the specification of the Mathers patent discloses a cast iron rim on the spider or not. (See p. 64, Q's 112–119.) He is biased in favor of the Appellant. His evidence from (Q's 113–132, p. 64–65,) he claims to know all about their English patents, yet he does not know how the spider is constructed in that patent. (P. 64, Q. 117.) He answers Question 119 different from the same Question 131. The witness never knew that Mather's patent had no concave surface to rim, but only convex, or that he has only a sub rim cast on the pulley and puts his wrought iron rim over this, and could not use a rim concave on under surface. Mathers, in their opinion, bends it like Medart, because if he did not he would have to go over it twice.—[P. 81, Q's 30–39.]

Steen finally admits that the rim, according to Mathers, is bent into a circle first, but says it does not mean anything, (P. 84, Q. 63.) and then dodges the conclusion, so anxious is he to make it appear that it is the Medart patent, (P. 84, Q. 64), and says "it must be either flat or convex, when it is formed up." (P. 84, Q. 64.) He finally, in despair at the cross-questions, says the words "thus formed should be left out." [P. 84, Q. 66.]

Steen admits on cross-examination that he never read the Mathers patent. [P. 79, Q. 1–3.] Mr. Wheaton, Counsel for Appellants, read the gist of the patent to him, and asked me if there was any difference in the formation of the pulleys, [P. 79, Q's 4–7] did not

take these patents in his hands to study them. [Q's 7–9]. Didn't know whether there was any drawing connected with the Mathers patent. [P. 79, Q. 11.] (There are no drawings with the Mathers patent). [See p. 106–107.] Yet he says his conclusion with regard to the formation was not a hasty one. [P. 79, Q. 12].

Birch does not know how the spider was constructed in the Mathers patent (p. 64, Q. 117). Mr. Wheaton read the specification of the Mathers patent to Birch; witness never read the English patent at all. [P. 64, Q's 114–117.]

He, like Steen, contends that the rim in the English patent is bent concave and convex at the same time it is bent into a circle like the Medart because Mr. Wheaton told them it was, and because it would be foolish to do it at two operations when it could be done in one. Their cross-examination on this point was not at all satisfactory to themselves as will appear from their answers. [See p. 64-68]. This cross-examination shows that they had made up their minds that the rims were made that way and they were going to have it that way whether or no.

There cannot be much said in favor of the superior opinion of an expert who does not know any more about the center of gravity and the geometric center of a pulley than is displayed by this witness in answers [p. 67, Q's 151-156.] The only reason he gives for saying the rolls in the Mather's patent are the same as in the Medart patent is because they have to be made so as do the work. [P. 69, Q. 166.]

According to Meese, Complainants' witness and who is a practical pulley maker, "A mechanic following the specification of the Mathers patent, would bend the rim into a circle first, and then put the crown on it after it was bent. [P. 89, Q's 1–8.] As late as 1873, date of Mathers patent, he knew of no rolls, which would bend a

piece of iron into a circle and crown it at the same time. [P. 89, Q's 5–10.] First learned of such rolls in 1883, when he saw them on Medart's patents. [P. 90, Q. 11.]

These were the same pulleys which Birch testified about, [p. 44, Q's 5–8, p. 76, Q's 8–13,] for they were the ones which were made larger than they had patterns for. [P. 76, Q. 13.] Steen says: If it had paid him he would have fitted it (the rim) up with rolls. [P. 82, Q. 42.] Bird says: They were made with rolls and a piece of iron.

Steen, p. 85, Q's 69–77, admits that in Complainant's Exhibit Respondent's Pulley the edges of the rim would have to be contracted nearly an inch or the center expanded that much if it was dished before it was bent into a circle, which would either buckle the rim or straighten out the dish. This is conclusive that these rims were flat in the Mathers patent.

COMPLAINANT'S REBUTTAL EVIDENCE ON MATHER'S PATENT.—WITNESS MEESE.

Meese says the rim, by Birch's method, as shown by his sketch, could be bent very little, in fact, hardly any, unless the rolls sprung enormously. It would break the roll and not bend the iron. In order to bend the rim it would have to bend the roll, (p. 91, Q's 19–21). "Bending rolls" was understood to mean rolls for bending boiler iron or wagon tires, and applied to straight rolls. (P. 91, Q's 21–22).

From Q. 1 to Q. 8, p. 89, he says a mechanic following the specification of the Mathers Patent would bend the rim into a circle first, and then attempt to crown it afterwards.

That at the date of the Mathers Patent there were no rolls known to the art which would bend a rim into a circle and concave and con-

vex it at the same time. (P. 90, Q. 9.) He first came to know of such rolls in 1883, when he saw an advertisement of Medart's Patent pulley. We could not conceive how a rim could be bent convex.—(P. 90, Q. 11).

If the specification of the Mather's patent had been shown me before I knew anything about crowning rolls I would not have known how to do it.—[P. 93, Q. 15.]

By that part of Mather's specification where is said "and is bent into form" by passing it through "bending rolls" a person would understand to make it into a circle.—[P. 94, Q. 17, also Q. 18.]

Irregularities are greater when a cast iron rim is attached to the spider than where it is not.—[P. 98, Q's 71–76.]

WITNESS LYNCH ON MATHER'S SPECIFICATION.

To follow this Specification, as I understand it by reading it, I should certainly think he was bending it into a circle first and then afterwards running it through other rolls and crowning it.—(P. 101, Q. 6.)

Lynch gives his reasons for this conclusion in Q's 30–33, p. 103.

It does not anticipate the Medart patent then, for it is not for the same invention.

It cannot limit the scope of the invention for the same reason and for the further reason, that foreign patents do not limit or curtail the scope of American Patents, (See Section 4487 Revised Statutes, U. S.,) where it is said "No person shall be debarred from receiving a patent for his invention or discovery, nor shall any patent be declared invalid by reason of its having been first patented, or caused to be patented in a foreign country, unless the same has been intro-

duced into public use in the United States, for more than two years prior to the application. But every patent granted for an invention which has been previously patented in a foreign country, shall be so limited as to expire at the same time with the foreign patent."

Refers to O'Reilly vs. Morse, 15 Howard, p. 62.

"The Commissioner of Patents shall decide whether it is for the same invention, and if it is, shall limit it for the period of the foreign patent. If not, he shall grant the patent for the full term of seventeen years."

Section 4923 Revised Statutes, U. S., says: "Whenever it appears that a patentee, at the time of making his publication for a patent believed himself to be the original or first inventor or discoverer of the thing patented, the same shall not be held to be vojd on account of the invention or discovery, or any part thereof, if it had not been patented or described in a printed application. That is, made patent or laid open by drawings or described by words in some printed publication."

A foreign patent is not a printed publication within the meaning of this Statute.—(See Howe vs. Morton, First Fisher, Patent Cases, 586.)

The question of whether it is for the same invention is a question of fact conclusively for the Commissioner of Patents to determine, and the fact that he issued the American Patents without limitation is conclusive evidence that he judicially found that the American patents were not for the same invention as the English patents. The foreign patents, offered in evidence cannot be received in evidence under Section 25 of the Act of July 8th, 1870, for that contemplates a foreign patent for the same invention, and not for an invention similar, or a patent containing some of the elements of the

invention patented in this country. It must be a patent for the same invention.

Butterworth vs. The United States, 112 U. S. P. 50.

Where the whole question of the power of the Commissioner is fully and elaborately considered in an opinion by his Honor, Chief Justice Mathews, where he laid down the above law, and also said that the Commissioner had exercised his judgment and discretion in the matter.

The same see:

Holmes Electric Powder Company vs. M. B. Allen, 22 Fed. R. P. 341. 23 Fed. R. 340.

Brooks vs. Norcross, 2 Fisher, 661.

Burke vs. Valentine, 5 Fisher, 356, 9 Blatchford, 479.

Collar Company vs Van Dusen, 23 Wallace, 530.

The answer then to the defendants with regard to the Mather's patent is, use it, but don't try to break ours with a thing that is not the same invention, and thus try to reap the emoluments of our industry.

The other English patent introduced by the defendants is for a removable section of both the spider and the rim, and the rim is made flat and has neither convex or concave surfaces and instead of being made in one piece is made in two pieces and is a wooden band instead of a metalic rim. It is not for the same invention, neither is there any evidence that it is a practicable pulley. A foreign patent to prevent the issue of an American patent must not only be for the same invention, but must be proven to be a practicable working device.

Harwood vs. Mill River Manufacturing Co, 3d Fisher, 526.

ANTICIPATING DEVICES.—VULCAN IRON WORKS PULLEYS.

The Vulcan Iron Works Pulleys said to have been made in 1852. Witness Birch does not remember whether he worked on them or not. (See P. 44, Q. 7.) Does not tell how they were bent into a circle, though asked.—[See P. 48, Q. 27.]

These rims were rolled up in the boiler shop and fitted and riveted to the spider there, therefore the witness did not see it done. (See P. 45, Q 8.) There was a strip of iron put in the center of the plate, and the rolls were straight ordinary boiler rolls. (See p. 61, Q's. 80–81.)

These rims were crowned by the straight piece of iron being put into the rolls on a straight piece of sheet iron designed for the rim, all the crowning there was what the pressure of the iron would make while the rim would be bent into a circle. (P. 72, Q. 87–100.) They were not turned or ground. (See p. 62, Q.9 $2\frac{1}{2}$.)

The Witness, Birch, did not make these pulleys at the Vulcan Iron Works himself. [P. 63, Q's 109–110.] Nor did he superintend the construction, nor was he foreman, but a mere workman. [P. 64, Q's 110–111.] Did not "critically examine them, just casually examined them." (P. 64, Q. 111.) I submit the facts sworn to by this witness are too uncertain and clothed in too much doubt to have that certainty necessary to defeat a patent under the ruling of this Court.

According to Witness, Steen, these Vulcan Iron Works Pulleys were made in 1853, (p. 76, q. 8) had cast hub with wrought iron arms (q. 9) and five feet in diameter, (Q. 11) face eight inches. (Q. 13.) He did not make or assist in making them. [P. 76, Q. 8.]

STEEN CONTRADICTS BIRCH.

Birch says:

The spiders were cast iron. [P. 44, Q. 8.]

Steen says they were made with a cast iron hub with wrought iron arms. (P. 76, Q's 9–11.)

Birch says the face of these pulleys were crowned convex and concave and shows how it was done with rolls and piece of iron. (P. 45, Q's 13–23.]

Steen says they were not crowned, but straight. [P. 77, Q. 19.]

Birch says these pulleys were "about eight inch to fifteen or eighteen inch faces," as the Record has it. He really said: About eighteen—from fifteen to eighteen inch face. [P. 45, Q. 8.]

Steen says they were not very wide, about eight inches. [P. 76 Q. 12.]

EVIDENCE OF MEESE ON THE VULCAN IRON WORKS PULLEYS.

He states that a rim could be bent very little—in fact, hardly any, by rolls like the Birch sketch—unless the rolls sprung enormously, and then it would break the rolls and not bend the rim. (P. 91, Q. 18.) In order to bend the rim it would have to bend the rolls.

By the term "bending rolls" in the art in 1873 was meant rolls for bending boiler shells or wagon tires or hoops. [P. 91, Q. 20.]

If a rim was bent like Birch's sketch it would spread the rim and not lengthen it. (P. 99, Q's 1–3.]

IT WAS AN ABANDONED EXPERIMENT.

There were never but "four or five or six" made, and they were

made from 1853 to 1856, and never any made afterwards. (P. 74, Q's 227–228.) (P. 76, Q's 13–14.)

Birch says: They took a sheet of iron the length that it required for the diameter of the pulley and then it was rolled, and in the center there was a narrow strip of iron put so as to bring a pressure in the center of the plate, so that the pressure of the iron there would spread and naturally make the rim oval or concave on the outside." (See Birch's evidence, answers 5–12).

Q (by Wheaton)—"On which side was the rim concave?"

A—"On the outside?"

Q—"Just illustrate with your hands."

A—(Witness does as requested.)

Q—"That would form a convex surface, wouldn't it?"

A—"Oh, convex, I meant, on the outside."

He says there would be no difference between the manufacture of the rim made in 1863 and the way described in Complainants' Patent, Exhibit "C." (See Birch's evidence, Answer 21.)

He further says there is no difference of the rolling and bending the rim in the Exhibit "C," and the Mather's English Patent. (See answer 25.)

When asked by Mr. Wheaton if there is any difference in the means used, said, unhesitatingly, "No difference at all." [See answer 26.]

On further direct examination the witness developed not only a willingness to make the pulley made in 1853 exactly correspond with the Medart pulley in the minutest particular even to the transverse lugs on the ends of the arms, but also, to make the English patents exactly correspond to the one made in 1853 and to the Medart patent shown in exhibit "C," thinking all he had to do was to make the Complainant's patent, the English patents, and the one he claims he saw made in 1853, all exactly alike in every particular.

When he came to Cross-examination he seemed to favor the de-

fendants in almost every answer; for instance, he says the lugs in the defendants pulley, marked "Complainant's exhibit, Respondent's pulley," were turned off instead of ground off. (See answer 62.) He says that he can see marks which look like turning marks on the lugs. He says that he is perfectly familiar with the specification of the Medart process patent, and when asked to tell how he would make a pulley by it, makes a fatal blunder in saying that the spider would be bored out first, then he would grind off the lugs, and then it would go to the former that would be set true by the outside, and then a hole bored, so as to make the hole central with the outside of the rim." (See answers 69, 70–71.) This is not the Medart process at all, as will appear hereafter.

Finally he says: "He cannot tell how he would make a pulley by that specification." (See answer 75.)

He shows his anxiety to serve the defendants by frequently referring to the ends of the arms of the defendants pulley being turned off, and not ground off, and that, too, when not asked about it. (See answer 76.)

This witness has a careless and loose way of testifying as is shown by his whole evidence, and particularly by the indiscriminate use of the terms concave and convex, and by his saying that he made the curvature on the rim by the use of a narrow strip of iron on the outside of the rim when he should have said inside. (See answer 80.) And again saying that he used the strip of iron on the inside of the rim. (See answer 81.)

In the fore part of his deposition he leaves the impression that he made these rims himself which were made in 1853. (See answer 12.) By Answers 83 and 84 he says that he did not roll them and did not superintend the rolling of them.

He says that the piece of metal which was put in the center did not follow any curvature at all, it was the curvature of the plate out-

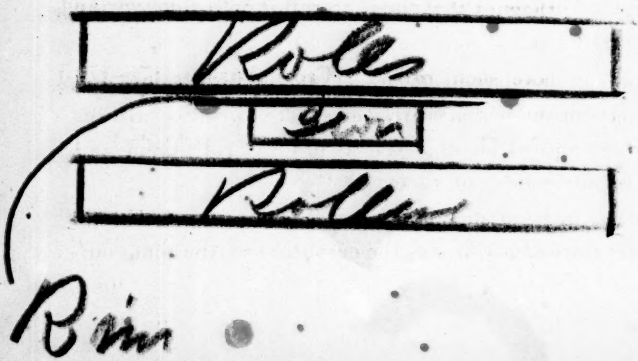
side. (Answer 87). In answer 91 he says: "It gave a concave and convex surface to it.

In answer 92 he says: "It threw the outside down, and not the center up." In answer 95, he says: "All the crown that there was to that rim was just simply that crown, which was made on a straight roll by the pressure of the piece of iron in the center and no pressure at the edges. In answer 97 he says: "The width of those pulleys were from eight to twelve or sixteen inches. In answer 98 he says: "He never measured these pulleys to see how much crown there was in them."

In answer 93 he says: "They were rolled into a curve and crowned at the same time, while in answers 99 and 80 he says the rims were made in perfectly ordinary straight boiler rolls. In answer 93 he says, "That the pressure of the roll was sufficient to throw the outside edges down and at the same time roll it to the proper diameter."

This draft which Mr. Eccles showed the witness and which was marked "Complainant's Exhibit, Birch Draft," he says is the principle, only you've got the center piece too wide in proportion to the rim. [See answer 102]. He however says nothing about the center piece being too thick in the draft, though it appears five or six times as thick as the eighth of an inch, which is the thickness he said the center piece was by his Answer 82. This is the kind of a roll he says he rolled them in.

COMPLAINANTS BIRCH, DRAFT: (P. following, P.104.)



In Cross Question 109 he says he isn't positive that Talbert was the man who turned these rims.

In Cross Question 110 he says, "I did not superintend the making of them and was only a workman in the shop, and did not work on the rims."

In Cross Question 111 he says, "I did not critically examine them."

The whole tenor of the Deposition shows that he only casually observed how the pulleys were made and that he is trying to favor the defendants in all his evidence.

The reckless manner of his off-hand swearing and evident bias is fully exemplified in his evidence with reference to the Mather's patent. His effort to warp its meaning so as to defeat the Medart patent is too plain to leave any doubt where he stands.

In Cross-answers 171 to 175 he says that the reason he thinks that the Mather's patent specifications means to roll the rim into a circle and crown them at the same time, is because it would be the common sense way to do it. That is evidently the reason he thinks the center piece of iron would crown the rim in the pulleys made in 1853, because in the light of the present he thinks common sense would do it.

He says: "They did not have concave and convex rolls at that time and he never saw them at that time, to roll it into a convex and concave surface, and at the same time into a circle, but common sense would teach me to make such rolls." [Cross Answers 178–179.] Common sense teaches us to make inventions, too.

He assumes to tell the Court what invention is and admits he never saw rims of pulleys rolled up except those he spoke of. [Cross Answer 138.]

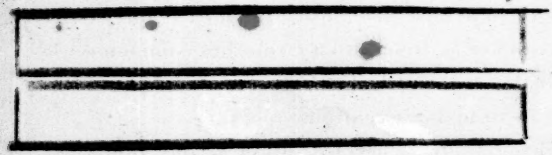
There were no more made except this lot. [Cross Answer 226.]

He says the rim on the defendants pulley could have been made by the straight rolls which they used in making the rims in 1853. [Cross Answer 231.]

He says the rim on the Defendants pulley, Complainants Exhibit, Respondents Pulley, is flat for almost six inches at the center, when it is plain to be seen that the convexity begins almost at the very center and continues to the extreme edge of the rim.

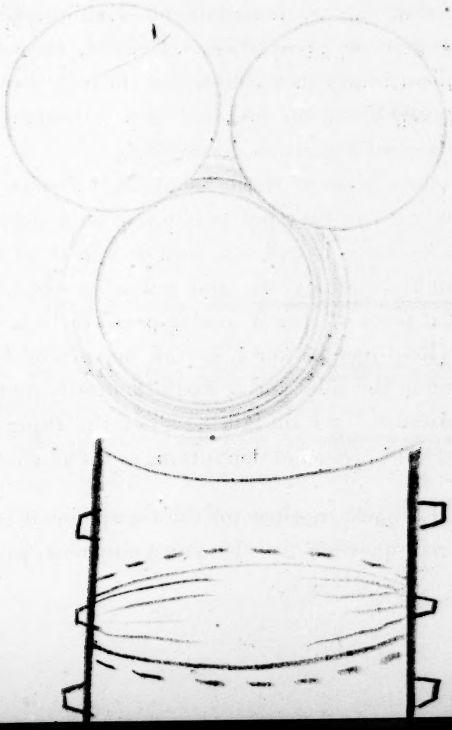
Now it is utterly absurd to any mechanical mind that the crown usual to belt pulleys could be put in a rim by any such pair of rolls, or that any convex surface at all could be made in the rim when it was bent into a circle and made convex at the same time by any such method as he explained, for the circular bending would have a tendency to keep the edges pressed out against the outside roll and would result in the rim of twelve or sixteen inches width coming out of the rolls perfectly flat and not convex as the witness would have you believe from another, or convex and concave as he would have you believe by another answer; especially would this be the case when the center iron used is only an eighth of an inch in thickness and the inside roll is situated between the two outside rolls as they are in ordinary boiler rolls.

These are ordinary straight boiler rolls:



And by them it would be impossible to bend a rim into a circle and crown them as he says it was done in 1853, for you see that the inside roll has not and cannot have a direct pressure on either of the other rolls, sufficient to have any effect upon the rim as spoken of by Birch.

The only possible way in which a concave and convex surface can be bent into a rim as in Medart's pulley, is in bending it in rolls made for that especial purpose, which are shown in figures 4 and 5, of Patent, Exhibit "A," which rolls consists of a center roll which is convex on its outer surface and impinges on the inside of the rim and two or more outside rolls lying close together and impinging on the outer surface of the rim, thus:



Philip Medart says that a rim with a convex and concave surface cannot be made except by bending them into a circle at the same time they are bent into a convex and concave shape in cross section, for if you bend them into a circle first and afterwards attempt to crown them they will straighten out, and if you crown them first and then attempt to bend them into a circle they will kink on the edges.

Constant Meese also states that he has been in the iron business for twenty years and the first time he every knew of any means of rolling a rim into a circle and bending into convex and concave shape at one and the same time was in 1883. He says that he and Mr. Clott saw Medart's advertisement and could not conceive how a rim could be bent convex as there shown.

We then looked up the patent and saw these rolls. (See Meese's evidence in rebuttal, second deposition, answer 11.)

He looks at sketch, Complainants Exhibit, Birch Draft, and says that the rim on Complainants Exhibit, Respondents Pulley, could not be bent in any such rolls unless the rolls sprung enormously, and then it would break the roll, and then it would not bend the rim. [See Meese's second deposition, answer 19.]

If you take a piece of sheet metal eight inches wide and long enough to make a rim for a pulley two feet in diameter and place a piece of iron between it and the roll of a pair of ordinary boiler rolls or straight bending rolls and put a pressure on sufficient to flatten out that piece of iron it would spread the rim and not lengthen it at all, (Re-direct answer 1, second deposition) because there is less resistance on the sides and it would naturally go to where it has the least resistance. "I am talking about the thing practically and not theoretically." [Second deposition, re-direct answer 2.]

Henry H. Lynch, testifies for the Complainant in answer to Mr. Wheaton's cross-question 2, "Do you know how, prior to 1880, the

usual crown or dish was put on these rims during the process of manufacture?" he says that in 1875 he had a pulley made with a wrought iron rim and a crown was put into it by hammering. It was an endless job to get it into any kind of shape and it cost a great deal of money.

"It was made in the Golden Gates Miners Iron Works in San Francisco." (Cross Question 4.) "Hammering it would weaken the metal more than by rolling it." (Cross Answer 16.)

"You can buy a pulley now that is much better." [Cross answers 16–17.]

"The rim of that metal was just rough, just as the metal left it." [Cross answer, 18.]

"No filing, nor was it put into a lathe." [Cross answers 19-22.]

"The outside of the rim was not turned or finished up in any way. They did not face it." [Cross answers 23–24.]

BIRCH CONTRADICTED BY STEEN.

Mr. Steen, the only other witness for the defendant, who was foreman in the Vulcan Iron Works in 1853, and who made the pulleys referred to by Birch, said "that they made nothing but flat faced pulleys and that those pulleys had not a convex surface." (Direct answers 17 and 19, and also cross answers 39 to 44); also cross answer 45.)

This Steen, who was foreman in the same shop in 1853, at which time Birch was workman, and who made these pulleys referred to by Birch, flatly contradicts Birch as to the way the rims were made on these pulleys. Birch said they were convex and Steen said that none were made convex, but all were made with flat surfaces.

This of itself would be sufficient to throw such doubt around it

as to make it utterly worthless as an anticipating device under the rules of law; for is the Court to believe Birch in order to defeat a patent rather than believe Steen in order to sustain one. But added to all this is the fact that Mr. Meese, who has resided and done iron and pulley business in San Francisco for many years never heard of it and he and his partner could not conceive how the Medart's crowned and made their rims concave until they went and saw their patents; and the fact that Mr. Lynch, a mechanic of extensive information, and a superintendent of one of the Cable roads here, even as late as 1876, knew nothing about the pulley rims being made that way; nor the Golden Gates and Miners Works knew nothing about them being made that way prior to 1876, but hammered one out for Mr. Lynch, which, as he says, was an endless job. These facts throw such doubt about the existence of the thing as well as about its practicability that it is convincing that it either never existed, or if it did was not a successful thing and was abandoned as a lost art from 1853 to the date of the invention patented by the Complainants, or that if the center piece of iron was used, it was used for a different purpose and produced a different result, than that of convexing the rim or leaving it straight on the center and bending it down at the edges.

The rim, then, which Birch says he saw made in the Vulcan Iron Works, and which Steen says was never made, and which Lynch, Meese, and the Golden Gate Company never knew anything about, though engaged at the time in manufacturing mining machinery, including pulleys, is so indefinite, both in its existence, made of construction and practicability, that it amounts to nothing as an anticipating device and if it had been the identical same thing, and if the proof was positive beyond a reasonable doubt that it did exist it was abandoned and cannot anticipate.

"The evidence relied on to establish prior use or prior invention

should not be vague, shadowy or uncertain, but should be clear, distinct and convincing, so convincing as to not leave a reasonable doubt in the mind of the Court, of the truth of the fact. It must be of that high character that convinces the Court beyond a reasonable doubt that the thing existed, was practical and reduced to practice, not as an experiment but as a completed and subsisting invention." (See Everist vs Buffalo Lubricating Company, 20 Fed. R. p. 848).

In the following case the Court says that "It is seldom that a defendant cannot make it appear that he has discovered new evidence in support of the defense of prior use." (Hicks vs. Ferdinand, 20 Fed. R. p. 111).

"Where there is any doubt as to the priority of either invention or prior use, it will be resolved in favor of the patent." Patterson vs. Duffy, 20 Fed. R., p. 640–641.

There is absolutely no proof of prior use, determined by this law, in this case.

Furthermore, it has been lately held that an abandoned application for a patent will not defeat a subsequent patent, though it was for identically the same invention. (See Beach vs. Fowler, Official Gazette, August 6th, 1889, referring to Brown vs. Guild et al, 23 Wallace, 181).

An inventor is supposed to avail himself of the prior state of the art.

It has been held that "an improved method of inserting and supporting artificial teeth, whereby former unsuccessful methods are altered, and a successful form of attachment supplied is an invention, a patent for which will be sustained, although the former methods, and the failure of the same may have pointed out the way, and been utilized for perfecting the improvement." [International Tooth Crown Company vs. Richmond, 30 Fed. R , p. 775].

"Any invention which remedies the radical defect in previous methods is not anticipated by former patents." (Prior vs. Mutual Life Insurance Company, 30 Fed. R. 787).

"A complete invention is not anticipated by a partial embodiment of the idea that was lacking in just those features necessary to its success." (Richardson vs ———————— 10 O. G., 507).

"To anticipate one patent by another, or prior use, it is necessary to show that the prior device was capable of practical and successful use." (Alis vs. Stowell, 9 Fed. R. 304).

"Where the patented invention is slightly different in construction from that in a prior patent, but was operated to produce an entirely different result its validity was sustained." (Pius vs. Wemple, 1st Biss., 87).

Such was the case in the well known driven well cases and also in the well known patent of singeing the fuzz off of lace by passing a gas jet rapidly and regularly under the lace by means of machinery, a thing which had previously been done by hand.

As to what constitutes invention see brief on that subject heretofore filed by complainants in this case on demurrer, and herewith attached.

We claim then that this patent has not been anticipated either by the Mather's patent or by the pretended prior use and must be held to be a good and valid patent. And we also claim that it covers all its claim pretends to cover.

INFRINGEMENT.

A comparison of the two pulleys manufactured by the parties herein is conclusive evidence of infringement. None of the officers of the Appellant nor the individual Appellant, Mr. Taylor, go

on the stand to deny the infringement, nor do they introduce any evidence that they do not infringe.

The Appellees witnesses all testify to infringement, and that the Appellants pulley contains the inventions of the Appellee. See Record, p. 34–35, Q's 5–14. Also, (p. 39–41, Q's 2–18.) Also, (Circular, p. 104–105) which was admitted as being published by Appellants prior and subsequent to the institution of this suit, (p. 39) shows the inventions of the Appellee, especially the convex and concave rim. [See 2d figure of Circular.]

Steen admits that the rim on the Respondents' pulley was bent into a circle and made convex and concave at one and the same time. [P. 85, Q. 77.]

The Risden Iron and Locomotive Works first commenced to manufacture the infringing pulley after Clott & Meese were licensed by the Medart's, (P. 90, Q. 12), and after they had advertised the Medart pulley, (P. 90, Q. 13) and after we had acquired considerable trade in the pulleys. [Q. 14.]

They would not let the foreman of Clott & Meese in to see how they made their pulleys. (Q. 15, P. 90.)

The cross-examination of Steen from page 84–88 admits that Complainants Exhibit, Respondents' Pulley could not have had the rim bent into a circle, and then bent convex and concave without it would be liable to distort the rim. It would be more convenient and cheaper to complete it in one operation. (P. 85, Q's 74–77.)

The defendants infringe if they sold the pulley marked "Complainants' Exhibit, Respondents' Pulley."

The defendants admit that they manufacture this pulley by admitting that they issued circulars marked "Complainants Exhibit

Circular," both before and after bringing of this suit. (See answer 2, Meese's evidence.)

Mr. Meese swears his firm bought this pulley of Respondents in San Francisco, California. (See Meese's evidence, answers 3 and 4.)

Meese says the rim of Complainants' Exhibit, Respondents' Pulley was crowned and bent into a circle before attaching it to the spider at one and the same time. (See Meese's evidence, answer 18).

Medart swears to the same thing, and also that he instructed them to buy the pulley of the defendants to see how it was made.

This pulley has both a convex and concave surface on its rim as Complainants' Patent Pulley has, and the rim is also made by bending it into a circle and making it convex at one and the same time.

Medart says that Clott & Meese bought a pulley of the Respondents at the request of his firm to see how they made their pulleys. (See Medart's evidence, answer 6–8). He says he examined it closely and from that examination can tell how it was made and says that the rim was crowned and bent into a circle at one and the same time. (See answer 12).

That the rim is convex and concave is apparent from an inspection of the pulley, that the rim thus convexed and concaved is attached to a metal spider having lugs at the ends of the arms is apparent from the inspection of the pulley.

To all this evidence the defendants remain silent, and do not go on the stand to deny these facts; hence it must follow that they made pulley in evidence which has a concave and convex rim attached to the arms of a spider as the Complainants' Patent shows, and thus infringe the first claim of this patent.

They also infringe this claim, not only because they have a concave and convex rim attached to a metal spider, but because they make these rims convex at the same time they bend them into a circle and by one and the same set of rolls as the Complainants do and

because they achieve the same objects and do it in substantially the same way. They also achieve the same advantages, and in fact they have the identical same thing, and therefore infringe this patent.

I will not insult the intelligence of the Court by quoting law on infringement in this case, because both devices are precisely alike; they both achieve the same results, have the same advantages, and are the same thing. Like Webster's Car Wheels, put them side by side and they are exactly alike. The trade does not distinguish them apart, the one from the other, neither can your Honors.

I will therefore proceed to the consideration of Patent 248,598, reminding the Court that much that has been said here will be applicable to that patent and need not be repeated.

———

PATENT NO. 248,598, Dated Oct. 25, 1881.

Much that is said of this patent will apply to patent No. 248,599, which is Exhibit "A," which, though being of one later number than 248,598, and being of the same date, is for an invention made by Medart prior to the invention patented in 248,598 exhibit "B." The application in number 248,599 exhibit "A" is dated March 15, 1881, while the application in 248,598 exhibit "B" is made August 29, 1881. Between the dates of the applications the inventor, by experiment, had learned how to make the center of gravity coincide with the geometric center better than is shown in the process patent. In other respects what will be said of patent exhibit "B" and what has been said about exhibit "C" will apply to this process patent, exhibit "A."

The object of the patentee in this patent, exhibit "B," is to make a true and accurately balanced pulley.

He says in lines 11–15 of the specification, "That his invention consists in a pulley which is perfectly true and accurately balanced—

that is, a pulley in which the center of gravity and geometrical center or axis coincide."

In lines 15–40 he states the defects which had existed in various kinds of pulleys in use prior to the date of his invention; among others he mentions cast iron pulleys which may be of accurate shape, but not of perfect balance, which is a fact known to all persons versed in the manufacture of pulleys. He also proceeds to point out their defects. He says, "Thus while cast pulleys are of accurate shape they cannot be practically produced, owing to the irregularity of the weight of metal at different portions of the rim, and to contraction in cooling; the arms of the spiders, owing to the impracticability of making perfectly accurate and smooth castings and to contraction in cooling, will necessarily possess slight irregularities relatively to the center of the pulley; and unless these are removed and the ends of all the arms made exactly concentric with the pulley axis, the completed pulley will of necessity be imperfectly balanced—that is to say, the spider however made will be slightly imperfect in shape and unless the irregularities are cured before applying the rim the completed pulley will not be accurately balanced."

"In making my pulley the cast iron spider, A, is centered and bored." That is, after the center of gravity of the spider is found or after it is centered, "it is bored," and this bored hole is the axis of the pulley. And when the hole is bored, the lugs are then ground off exactly concentric with the axis of the pulley thus found.

"By thus preparing the spider the rim B, which is rolled perfectly true and uniform in shape, will be exactly concentric at every point, with the pulley axis, when laid around the spider, and the pulley therefore will be accurately balanced. In order to make the pulley even more true in shape and perfectly balanced, I then grind the rim concentric with the axis."

"The center of gravity of a pulley thus made is brought to co-

incide with the geometric center more absolutely than has heretofore been done."

"It will be obvious that if the pulley arms are not first ground off concentrically with the axis, and also the irregularities incident to the operations of the castings and cooling would remain as defects in the spider, and would be greatly aggravated by the grinding of the rims, because the lengths of the spider arms, being unequal without grinding, when the pulley rim is applied and ground, it will be cut away unequally—in some portions more and in others less—making the rim unequal in thickness, so that the final grinding operation, in order to make a pulley perfectly circular would greatly increase its want of balance, but by preparing the spider as above described, all defects are cured and pulleys of true shape and balance are produced."

His claim is, "The improved belt pulley herein described, having the ends of the spider arms ground off concentrically with the axis of the pulley."

Second.—"The improved belt pulley herein described, in which the rim and the ends of the spider arms are ground off concentrically with the axis of the pulley."

What is meant here by the "axis" is the axis formed on the center of gravity.

He has invented a pulley then that has a spider center, that is, which has the center of gravity found and then bored at this center, and then has the ends of the spider arms ground off concentric with the axis which is the previously found center, whether this previously found center is found by the eye or by balancing the spider or by centering it in any other way, makes no difference. Furthermore, it makes no difference whether the ends of the spider arms are ground off or turned off, just so the center of gravity of the spider is found

first and the spider arms are ground off concentric with this center, or turned off concentric with this center and the rim applied. It is sufficient if the center of gravity of the spider and the pulley is afterwards built in relation to the length of its arms and the periphery of its rim from this center. He has invented a pulley composed of spider and rim whose center of gravity had been brought to coincide with its geometric center.

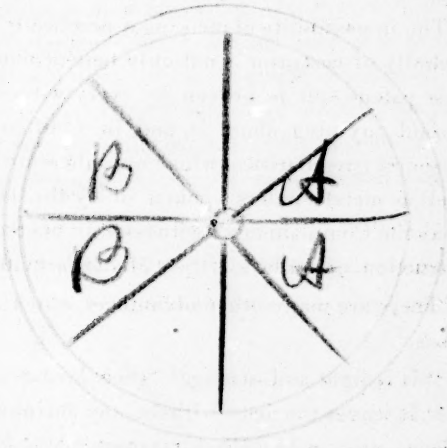
The advantages of this kind of a pulley are numerous over the common cast iron pulley, and over any other pulleys heretofore made, which cannot be made so that the center of gravity will be brought to coincide with the geometrical center on account of the irregularities in casting, and its advantages are numerous over the pulleys said to have been made by the defendants' witnesses, all of which pulleys were made irrespective of whether their center of gravity was made to coincide with the geometric center or not.

Thus a common cast iron pulley, which was the only kind of metal pulley that was in general use prior to the date of the Complainants' Patents or generally known to the trade, could not have been made so as to make its axis or center of gravity coincide with its geometric center, no matter how much its constructors might have labored to achieve that end, on account of the irregularities or inequalities inherent in casting it.

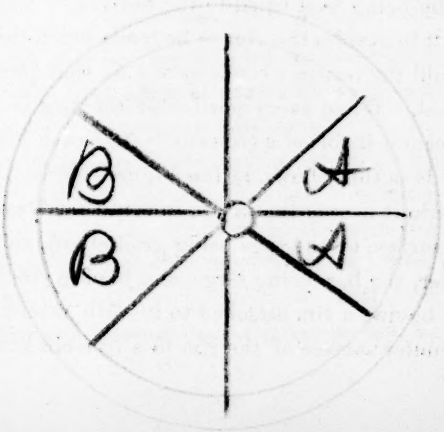
Thus a cast iron pulley could not be perfectly round if perfectly balanced, and could not of necessity be balanced if perfectly round.

Thus the sketch shows a cast iron pulley where the arm A has shrunk more than the other arms B, in the cooling, and if you attempt to make the center of gravity coincide with the geometric cen-

ter you will center it and turn it as seen by the dotted lines, which will make the rim thicker in some portions than in others.



If you turn it first and then bore it from its geometric center you will have the center to one side of the center of gravity, or the true axis of the pulley as seen in Figure following.



It will be true, but unbalanced. In neither case will the center of gravity be made to coincide with the geometric center.

The impossibility of making a practically perfectly balanced pulley wholly of cast iron is not only here demonstrated and pointed out in this patent, but is proven by every witness for the Complainant who said anything about it, and in addition to this the shrinkage strains and irregularities, which are inherent to every cast iron pulley as well as metal spiders spoken of by the Defendants' witnesses, as well as the Complainants' witnesses, is overcome by this method of construction of pulleys. (See Medart's evidence, questions 20–21).

There are many other advantages which this Complainant's pulley has.

"It is light and strong." (See Medart's evidence, answer 14).

"It leaves the arms without any shrinkage strains." (Medart's evidence, answer 14; Birch, answers 83–84–85).

"In attaching a rim to a spider ground with every portion of the bearing surface of the ends of the arms concentrically with the center it forms the outer surface of the rim to a true circle." (See Medart's evidence, answer 15).

"It will bring a thin rim to an exact circle and also stiffen the rim by being well fitted to the bearing." (Answer 16).

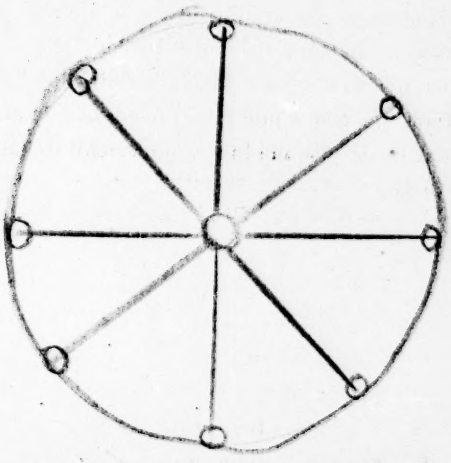
"It enables the rim to be made much thinner for it forms a base to hold the rim in a circle as far as that portion of the arc is concerned. When every portion of the lug is ground concentric with the center it forms a true arc." (Answer 17).

It is thus shown in the Figure.

So it is seen that a rim thus attached, every portion of the bearing surface of the lugs being ground off, an equal distance from the center, the lug being large and having considerable bearing surface, and having a rim attached to it with rivets, not only of itself forms the outer surface of the rim to a true circle as far as that part of the

arc is concerned; but it also stiffens that part of the arc by being well fitted to the bearing surface.

If a rim was fitted to a spider which had the ends of the arms round, or with an irregular bearing surface, such as a gas pipe run transverely to the rim, a different result would be achieved. Thus a round or irregular surface of itself would not stiffen that part of the arc of the rim, but its stiffness as would wholly depend on its connection with its adjacent arc of the rim, as seen in the accompanying Figure:

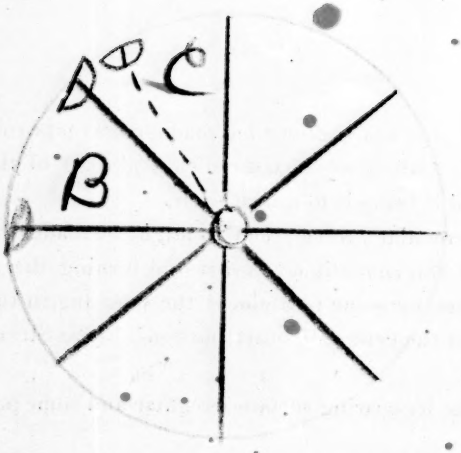


Which has a gas pipe bearing, or a leg made of gas pipe running transversely to the rim, which would not stiffen that part of the arc of the rim, nor would it bring it to a true circle.

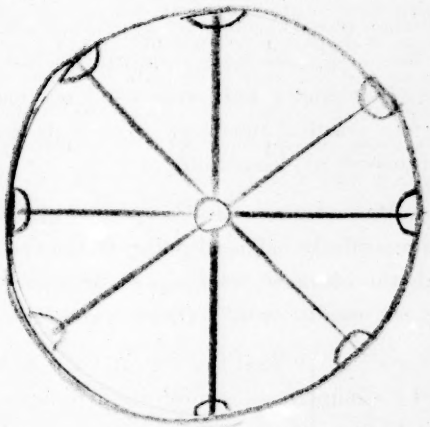
Nor would an irregular surface such as might be made by hand serve the purposes of this invention. Nor would turning the spider serve the same purpose, for some portions of the same lug in turning would be farther from the center of other portions. (See Steen's evidence, Answer 18).

This would make its bearing surface irregular and some portions

farther from the center than other portions, which would be caused by the tools catching in the hard places or by springing the arms and lugs over closer the center at one side of the lug than at the other, which would be the result in turning it and not grinding it. (See Meese's evidence, re-direct answers 3–4.) What is meant here is that if a spider was put into a lathe and attempted to be turned off at the ends of the arms it would spring the arms so as to make the bearing surface of the lugs farther from the center at one side of the lug than at the other, and when the rim is riveted onto it, it would be held by the bearing surface in an untrue arc of a circle, and not in a true arc of a circle as in Complainants' patent. Thus Figure one is what would happen to a spider which had its lugs turned off instead of ground off, the arm would either bend in the direction of the dotted lines as at C, or else the lug would yield its farthest edge from the tool as at B.



And this would make it farther from the center at the one side than at the other, or else both edges would yield from the tool more than the center would and both would be farther from the center of the spider, than the center of the lug would. And when a light rim was riveted to the surface of the lugs thus formed it would cause a flattening of the rim at that portion of the arc supported by this particular lug. Rims attached to lugs thus irregularly turned off would make a pulley with irregular arcs at different portions of the rim, thus:



. But if made after the Complainants patent every portion of the ends of the arms or lugs will be ground off exactly concentric with the axis, and a rim however light, when riveted onto the surfaces of each lug will not only be in a true circle in every part of its arc, but will be greatly stiffened and supported by reason of the fact that every portion of each lug is exactly equal distance from the center of the spider as well as each lug is; and the result is that you have a pulley which not only has its center of gravity brought to coincide

with its geometric center, but which has its rim, however thin, held into a perfect arc over each lug and strengthened thereby. And you have a pulley, no matter how thick the rim may be which has no undue strain on it by reason of any irregularities existing in the surface of the lugs.

The perfection to which this art has been carried by these patents is exemplified by the fact that the Defendants hunted up a pulley which bears on its face evidences of long use, and which was selected by them evidently to show as unfavorably for the Complainants as possible, and when tested it only lacked two and a half ounces of being perfectly balanced; and their own witness, Steen, said: "That the difference of two and a half ounces did not make any practical difference in the practical operation of that pulley." (See Steen's evidence, last answer of deposition).

And Mr. Meese, witness for Complainant, says: "It would be considered as a perfectly balanced pulley in the trade, and would not interfere with the ordinary workings of the pulley at such rate of speed as they are usually used." (See answers 24–25).

He further says: "That the firm of Clott & Meese, who are licensees of the Complainant manufacture pulleys after the Medart patents; that they send out pulleys, without rebalancing, to fill orders for perfectly balanced pulleys which were to run at a very high rate of speed, and they never heard any complaint." (See answers 28–32.)

"The Complainant's Meese's Pulley is one that is taken from the shop and is so perfectly balanced that you cannot discover the thirty-second part of an ounce out of balance." The fact is that these pulleys are all practically perfectly balanced pulleys. This is a feeble attempt, indeed, to show that a patent is void. It is the drowning man catching at a straw.

THE ENGLISH PATENTS, AGAIN.

The English Patents cannot defeat this patent, for they are not for the same invention; and the same law applies to them here which was invoked in the discussion in relation to the prior patent C.

The English Mathers Patent is not for a pulley composed of a spider and a wrought iron rim, but is for a cast iron pulley inside of a wrought iron rim, as above stated. Moreover there is no evidence and there is nothing in the specification which discloses that there is any effort made to bring the center of gravity to coincide with the geometric center. In fact it was never thought of and could not be done any more than it could be done in a cast iron pulley. It is not therefore for the same invention and does not anticipate this patent.

The Gubbins English Patent has for its object a sectional pulley; has its rim sectional and has its boss or hub sectional, so as to enable it to be quickly placed on a shaft and be taken off again. This is the whole object and purpose of this patent. There is no disclosure in the specification, whether it is made of metal or wood. The Court cannot assume that it was made of metal simply for the satisfaction of defeating an American patent no more than it can assume that the center of gravity was made to coincide with the geometric center. The presumption thrown around our patent makes this pulley rim of the Gubbins patent made of wood. It shows on its face that it is in two parts while the Complainants' has its rim in one piece and its spider in one piece. Furthermore, the boxing in the drawing in this Gubbins Patent is evidently made of iron being drawn with different shading from the balance of the pulley and the spokes and rim are evidently made of wood. The spokes are round, like turned wood and are shaded like wood, and the rim looks like wood, for it has the same shading as the spokes, and it is wood. They might be made of wood and a lug of sheet iron nailed on the end of the lugs.

It is not the same invention.

THE PRETENDED ANTICIPATING PULLEYS, AGAIN.

The Pretended Anticipating Pulleys made in 1853, as well as those made in 1864 at the Vulcan Iron Works in San Francisco, are the same pulleys which were argued about in the fore part of this brief in relation to patent, Exhibit C.

The Defendant's witnesses say that these pulleys made in 1853 were about five or six feet in diameter and from about eight inches to fifteen inches face. The spiders were made and cast and they were bolted on the face plate of a large lathe and the ends of the spiders were turned off and after they were turned off the center was bored without removing the spider at all from the face plate. The rims were then put on. [See Birch's evidence, answer 9].

No attention was paid to making the center of gravity coincide with the geometric center whatever. In fact, they never made any effort to find the center of gravity. Birch, even to-day, does not know how to find the center of gravity of the spider before it was ground, as laid down by the Medart Patents, as will appear more fully hereafter from his evidence. Nor does he consider that it makes any difference whether the ends of the arms were ground off or turned off.

He says, "It made no difference whether they were ground off or turned off so long as they were true." [See Birch's evidence, answer 10].

"These arms of the cast iron spider were bolted onto a face plate. (Cross question 53).

"The arms bear onto wood blocks. It was generally the custom to put wood blocks behind each arm." (Cross Answer 55).

"So as to make a kind of elastic hold. If bolted up rigid against the face plate, there was a chance of cracking these arms. (Cross Answer 55.) "So they had to give. I never ground any cast iron spiders." (Cross Answer 57.)

He says: "That he read the specification of Complainants pat-

ent, Exhibit C, and heard it read by Mr. Wheaton, and understands the gist of it." (Cross Answer 60.) When asked to explain how a pulley is made in accordance with that patent, he says: "A spider would be bored out first, I should judge, or else put in some kind of a clamp to hold the hub, and then it would be ground on those lugs, on the outside of the lugs, so as to make a true concentric and then from there it would go to the former and would be set true from the outside and a hole bored so as to make the hole central with the outside rim. (Cross Answer 207.)

From this it is evident that he does not know how a pulley is made after the specification of this Medart Patent, Exhibit B. In cross-question 152, when asked how he would make a pulley so that the center of gravity and geometrical center would coincide, he says, "To get the center of gravity in a pulley we put it on two straight edges and put the pulley on a mandrill and let the center of gravity come to the bottom."

Q—"That is after the pulley is bored, then?"

"Yes, sir, that is after the pulley is bored." (Answer, Cross Question 153).

Again, he says: "He centers it from the outside." (Cross Answer 207.)

He does not consider it of any consequence, it is plain to be seen from these answers whether the center of gravity is made to coincide with the center of gravity or not; and it is equally plain to be seen that he does not know how to do it now.

Nor were any efforts made to make those two centers coincide in the ones that were made in 1853, but the spider was just clamped on to the face plate and the lugs turned off and the center bored without taking it off the face plate, wholly without reference as to whether the hole would correspond with the center of gravity of the spider or not.

They did not know it then, and it is plain that they cannot even now reproduce the Medart pulley after reading the specification, and having had them read to them.

If he cannot tell how to make the thing patented, what he saw produced cannot anticipate the patent. (See Bell Telephone Cases, where three hundred witnesses swore to a certain anticipating device but could not explain the Bell Telephone, held that what they saw was too indefinite to anticipate the patent.

Furthermore, he says that he did not turn them up himself, that a man by the name of Talbot did it. He can't say positively that he was the man. (Cross Answer 109.)

"Nor did he superintend the turning." (Cross Answer 110.) 'Just casually examined them."

"The reason they were made this way was because they had no patterns of that size." (Cross Answer 108.) They were not making an effort then to make perfectly balanced pulleys, not having that in view, but because they had no patterns of that size, and of course they made them just as they would have made ordinary cast iron pulleys. (See Steen's evidence, cross answer 113).

The witnesses, Birch and Steen, flatly contradict each other as to the way the rims of these pulleys were made. (See cross answer, 14, 44–47, Steen's evidence.)

Which can be believed, Birch or Steen?

It is familiar law that a witness is discredited in one thing must be discredited in all.

ABANDONED.

Furthermore, if this ever was an anticipating device it was abandoned as there wasn't any more made; but in 1864, when they received another order for pulleys, instead of making them as they

did these first ones, they took a cast iron hub and screwed gas pipes into it for arms and put a transverse lug of gas pipe on the ends of the arms, screwing them on also; the irregularities in the length of the arms were overcome by screwing the gas pipe in and out of the hub, and the gas pipe lugs were dressed off by hand. This last pulley has no bearing on our pulley, being unlike it in every particular. It does show, however, that they abandoned the pulley made in 1853, evidently because it was a failure, and substituted the one made in 1864 for it. They were farther off from the Medart Pulley in 1864 than they were in 1853. These pulleys were both made at the same shops, the Vulcan Iron Works.

This second pulley was also abandoned for there never were any more made until the firm of Clott & Meese began to manufacture the Medart Pulley as licensees, more than twenty years thereafter.

These pretended anticipating devices do not anticipate them.

First—Their construction and existence are too indefinite and uncertain to anticipate.

Second—They were not the same invention.

Third—They are at best but abandoned experiments.

INFRINGEMENT.

The circular issued by these defendants, not before and after this suit and marked Complainants' Exhibit Circular, showing a cut of the pulley and how it is made, and which was admitted on the record by them, proves infringement.

The Complainant's Exhibit, Respondent's Pulley, introduced in evidence, and proven to have been bought from them, showed infringement.

It has an equivalent to the cast iron spider; it has the wrought iron rim; it has the center of gravity coinciding with the geometrical center, and it has lugs, every portion of the surface of which are ground concentric with the axis of the spider. It is obvious that these lugs are ground off and that they perform the same functions as the lugs of the Medart Pulley. They run parallel with the rim instead of transverse with it only a colorable evasion. This, of itself, is evidence that the defendants knew they were infringing and tried to make a lateral lug in order to evade patent. The lugs perform exactly the same functions as the Medart lug, that is, they hold each arc of the rim in true circle. The spider performs, as a whole, the same functions and has the same advantages. The whole pulley, with its wrought iron rim riveted to these lugs, performs the same function as the Medart Pulley. The spider is subject to the same irregularities as to the length of arms as the Medarts are, (see defendants' witness, Birch, Cross Answer 36), caused by the uneven shrinkage in the cast iron hub. (See Cross Answer 40).

It would have to be centered, that is, the center of gravity found and then ground off concentric with this center of gravity in order to make the center of gravity coincide with the geometric center. It is practically an accurately balanced pulley and has all the advantages of the Complainant's Pulley.

It is the same thing, that is, it is the new improved pulley herein described, having the ends of the spider arms ground off concentrically to the axis of the pulley," within the meaning of this claim.

And Second, it is "The improved belt pulley herein described, in which the rims and the ends of the spider arms are ground off concentrically with the axis of the pulley."

The Complainant, Medart, says: "It is made with a spider and lugs on the ends of the arms that were ground off concentrically with the axis, and also the rim ground concentrically with the axis." [See Answer 11].

"It was made the same as my pulleys were made. [Answer 15].

Every portion of the bearing surface of the ends of the arms is an equal distance from the center. [See Medart's evidence, Answers 16 and 18].

"It leaves the arms without any shrinkage strains, and they are ground off concentrically with the center, and makes a light, strong and durable pulley." [See Answers 14 and 18].

The lugs ground that way form the outer surface of the rim to a true circle, and leaves the rim when ground off to uniform thickness." [Answers 15 and 18].

"It brings the arc of the rim to a true circle and stiffens the rim by being well fitted to the bearings." [See Answers 16 and 18.]

"This pulley, which I saw in San Francisco, possesses the same qualities which I have above spoken of." [Answer 18].

Meese says he bought the pulley of the defendants, and detached one of the arms, examining the face of it to see how it was made. (Answer 15.) He also says these arms were ground concentric with the center, before attaching the rim.

Both the Complainant's and Defendant's witnesses admit that the rim was ground concentric in the Complainant's, Respondent's Pulley, after the rim was attached.

The Complainant finds the center of gravity and then builds to this center, the defendant does the same thing. In every particular the defendant's pulley looks like the complainant's pulley and is the same pulley, and your Honors could not distinguish them apart if they had not been marked by the master.

To all this evidence of infringement, the defendants remain silent and though one of the defendants, Joseph Moore, was cited as one of the witnesses for the defense, who knew all about these anticipating devices, was not produced to testify, for fear, no doubt, we would prove by him the absolute infringement of these patents. If

he was not infringing it would have been very easy for him to go on the stand and convince the Court of that fact. He chose to remain silent on this subject. This fact, coupled with the facts that the defendants would not allow any one to go into their factory to see how they were making their pulleys and that they did not commence to manufacture these pulleys until some time after Clott & Meese had commenced to manufacture the Medart Pulley under their license; and after they had advertised the Medart Pulley extensively, and after Clott & Meese had acquired a large trade in the Medart Pulley, would prove infringement alone without any other evidence. Moreover, the Medart Pulley had been extensively used, advertised and introduced, and had met with great favor among persons in the pulley business, and pulley manufacturers had recognized the validity of the patents by taking license and paying royalties to the patentee long before the defendants began to make the pulley. And this alone would be sufficient proof of its validity and of the patentee being the first inventor thereof. Even though the same thing had been used in 1853 and left to be forgotten and pass out of mind until revived by the Medart's. That kind of use is not the kind of use which will defeat a patent. It must be a subsisting use and of such a nature that the trade is apprised of it and has the benefit of it; not a use which is allowed to lapse or an invention which has been abandoned as these were. It must not be an experimental use and remain forgotten only to be revived after another brings it into public use. Inventors are rewarded by the patent law for this very thing of bringing their inventions into public use and this is the very purpose of the patent law. He is the first inventor who first reduces the thing to practical use and brings it before the people in useful form, so that the public can get the advantage of the invention. This is what the complainants have done in this case. The books are full of such cases and the law is too well established to need citation here.

The Complainants in this case have invented and put into general use a new and meritorious pulley, advertised extensively, experimented greatly, and finally given to the public a pulley having the qualities detailed in the evidence, and which is a popular pulley, a durable pulley, a light pulley and a practically perfectly balanced pulley, and have gained a large and remunerative business for themselves and licensees. When they have done all this, at great expense to themselves, and when their invention is about to become remunerative, the defendants step in and make identically the same pulley, and ask the Court to help them to rob the complainants of the very thing which the patent law promises to secure to them and does secure; simply because they remembered after the lapse of years, and after the Complainants had done all this, that the Vulcan Iron Works had made a pulley in 1853 similar to the Medart pulley, but which had none of the qualities, advantages or functions of the Medart pulley, and was wholly unlike it, except that it had a spider and a wrought iron rim.

I take the liberty of referring the Court to the cases below cited on the question of infringement.

Tighlmann vs. Wirt, 2 Fisher, 229.
Tighlmann vs. Proctor, 102 U. S., 727–729.
Smith vs. Fay, 6 Fisher, 446.
McCormack vs. Talcott, 20 Howard, p. 405.

As to whether there is invention in these devices in addition to what has been said in the argument and brief on demurrer, I wish to say that a pulley having the qualities of the Medart pulley had long been sought after but had never been attained until the patentee attained it. And no matter how slight that is, if these qualities constitute the very thing which gives value to the pulley it is patentable and is the property of the patentee. (See Loom Company vs. Higgins, 105 U. S., p. 580).

Where Judge Blatchford says: "That although the change is very slight, yet the fact that it increases the capacity of the loom is conclusive evidence of invention." The difference existing between ours and what has gone before is very great and not very slight. In Walker on Patents, Section 28, it is said with authority: "If a particular result was long desired, and sometimes sought after, but never attained, want of invention cannot be predicated of a device or process which first reached that result, on account of the simplicity of the thing, on the ground believe that they could have produced the same result if required," [See also Zemser vs. Kermer, O. G., July 2d, 1889,] where the matter of patentability of inventions is fully and ably discussed in the opinion.

It has also been held that a patent which has been acknowledged by the trade as a good and valid patent by them accepting licenses and paying royalty to the patentee is evidence of its validity. (See Timken vs. T. D. Olin et al). Fed. R. ....., in which his Honor, Judge Sage, rendered the decision.

We claim then that all three of these patents are good and valid patents and that they have not been anticipated or that the scope of their original claims been in the least modified by the introduction of the English Patents or the pretended anticipating devices, and that the defendants have infringed all of said patents.

All of which is respectfully submitted:

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